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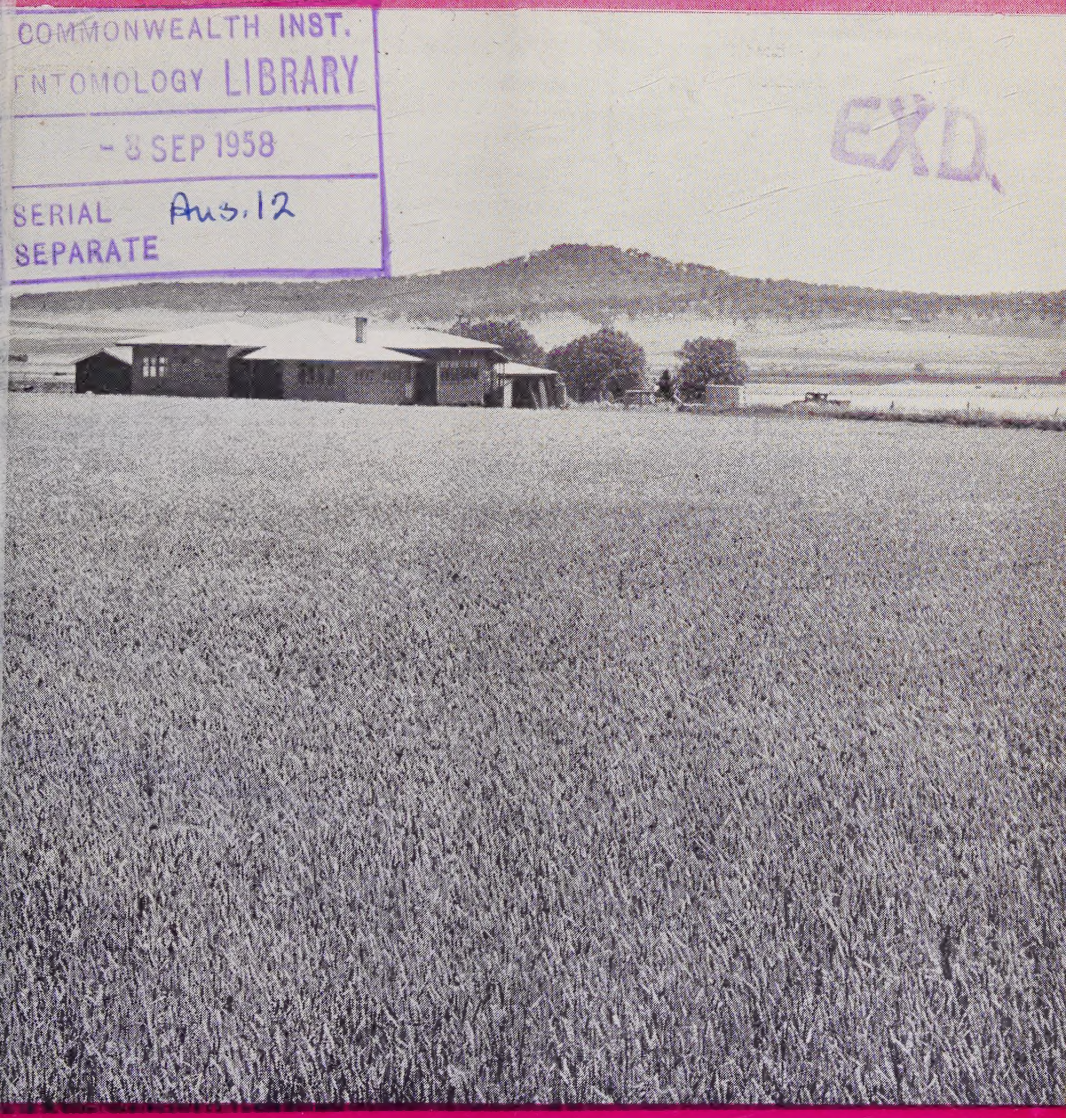

WHEAT FARM NEAR PILTON.

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Economic Guideposts For Farmers

By C. H. DEFRIES, Director of Economic Services.

It will be the job of the Economics Research Branch to provide the farmer with guideposts that will help him to make decisions on the complex business of farm planning.

Rapidly changing conditions call for a new approach to the farmer's problems. Old ways of thinking are being swept away by the economic winds blowing across the rural scene. Fortunately, new ideas are available to replace the old.

One such idea that is new to us is concerned with the economics of farming. We have paid little attention to it in the past. It is to remedy this lack that the Economics Research Branch has been created in the Division of Marketing.

It represents an approach to the farmer's problem of an entirely different kind from that which he has been used to.

The attempt will be made, through the work of this Branch, to provide the farmer with economic guideposts. We all like to know where we are going and how much effort it is likely to take in order to get there. When there are crossroads or a series of crossroads, guideposts are particularly welcome.

Sweeping changes in production techniques, capital requirements, marketing conditions and the cost structure as well as labour shortages and the development of mechanisation all emphasise the need to pay more attention to the economics of farming.

The decisions a farmer has to make grow both in number and in complexity because of these factors. There is so much more machinery available to choose from and it is not always a simple problem to decide whether the proposed purchase will be an economic proposition. Margins between costs and prices have tended to decline in recent years and this highlights the need to focus our attention on possible waste of resources because these are the leaks that drain away profits.

Here, in these changes, are the causes which create the crossroads. That is, the points where a farmer has to come to decisions and make up his mind which way he is heading. And these are naturally enough the points at which he looks around to see what help he can get.

What form can this help take? Farmers have become used to, and appreciative of, the kind of help they gain from the technical and extension services of the Department. This is based on years of research, investigation and experience in handling technical problems. Unfortunately, so far as the study of economics is concerned, these years are ahead of us and not behind us.

We have a very serious lag to make up. We are a long way behind. In the United States a book has recently been published with the title "Fifty Years of Farm Management".*

* "Fifty Years of Farm Management"—by H. C. M. Case & D. B. Williams, University of Illinois Press, Urband, 1957. (Dr. D. B. Williams is now officer-in-charge of the C.S.I.R.O. Agricultural Research Liaison Section.)

We can of course learn a good deal from the experience of this work in other countries. All major primary producing countries have services of this kind and the tendency is to increase them. This should all help us to avoid a mistake or two, we hope.

The fact remains that we have a great deal of groundwork to cover, for conditions here differ markedly from conditions in other countries. We have to compile our own data—there is no escape from this. We have to concentrate on lines of work that can be immediately useful, and go as far as we can with them.

Two major lines of work will engage our immediate attention. They are:—

A. Industry situation analysis.

B. Examining the economics of recommended techniques of production.

INDUSTRY SURVEYS.

Industry surveys are necessary to help define what the problems of an industry are. A survey of this kind was recently carried out covering the pineapple industry in co-operation with the Council of Agriculture and the Pineapple Sectional Group of the C.O.D. This was the first survey of its kind in Queensland. It set out to show what the structure of the industry is, how different geographical regions vary so far as the economic characteristics of the farm are concerned, what the implications of size of business are, and questions of this kind. It delved into the influences causing change and what kinds of changes were being developed. In other words, it helped to pin-point the problems of the industry, define them, measure them insofar as that is possible.

To provide a picture of the economic situation of a large industry, account has to be taken of the many categories of farmers who comprise it. There is considerable variation in farm size, farm type and management levels and unless the influence of these factors on income levels is known within reasonable limits then the knowledge of industry problems is incomplete. Certainly it can be said that discussion of industry questions is made very much easier when this kind of information is available—even if it is in an approximate form.

Industry surveys substitute significant facts for guesses. They can show what kind of farm goes along with success and what the factors are which contribute to this success. We must not assume that a successful farmer is one who adopts all the latest techniques. We must also know what economic results he gets from them.

FARM PROGRAMMES AND PRACTICES.

The most urgent need here is for us to have a better understanding of what technical recommendations mean in economic terms. Feeding practices, irrigated pastures, soil conservation, pasture improvement, fertilizer recommendations and improved techniques generally need to be assessed in terms of profit and loss.

There is a difficulty in this. This is the wide variation that exists between farms. What will be suitable for one farm does not necessarily apply to another farm. Allowances have to be made for such differences.

There is an aspect of this kind of work, too, which is of importance. It is not always possible to isolate one particular phase of the farmer's operations from the rest. Consequently the study of the economics of any particular technique may have to take account of other aspects of the farm. This is clearly seen in the case of soil conservation where the work needed may extend into all departments of the farm business. The results have to be measured in respect of the farm as a whole.

However, there are many occasions when a part of the story is better than no story at all.

FARM RECORDS.

It will be worth mentioning at this stage that many farmers can help themselves a lot and help us into the bargain by *keeping more records* of their farm business and of their operations. One of the most glaring deficiencies is our lack of information about what costs are incurred for various farm operations and what returns are obtained.

Costs include not only *money spent* but also the *physical units* such as hours of labour, machinery time, quantity of fuel for various operations, quantities of materials and so on.

It has been said that a pencil with a not-too-blunt point is a very handy implement on a farm. It is worth keeping it as sharp as you'd keep the bit of a drill and it will certainly pay dividends if used every now and again.

ECONOMICS AND AGRICULTURE.

Economics has an important role to play in the future of agriculture. It can assist in using our resources more efficiently and save unnecessary waste of these resources in misguided effort. The United States, Canada, United Kingdom and New Zealand have over the years developed comprehensive services to cater for the needs of their changing agriculture. These go a good deal beyond the two major lines of effort indicated in the foregoing. We shall have to do the same if we are to cope with the problems involved.

At the moment our attention is directed towards these obvious ways of developing *a more organised and less haphazard* approach to our farm industries. However, we shall need to avoid the dangers of over simplification. Work in these other countries has shown how complex the farm problem is. You cannot always add two and two and come to the conclusions that will help to clarify the situation.

Economics is a highly practical business tool that is used by all types of business management. In farming industries we know very little about its use because we have neglected it in the past. The farm business has many features which make it different from a manufacturing business such as hazards from seasonal conditions. This creates the challenge for us to discover in what ways economics can be harnessed for use in the interests of the farmer and his farm business.

It is interesting to note that in a recent survey of farmers in Iowa, a State of U.S.A., where economics work is of much more than average status even for over there, 94 per cent. of the farmers interviewed (1,074 farmers) indicated a need for various kinds of economic information for successful planning.

FARM WISDOM

Dehorn during the cooler months.

☆ ☆ ☆

Get dairy officer to check milking machine efficiency.

☆ ☆ ☆

Graze weed-infested pastures soon after milking to prevent weed taint.

☆ ☆ ☆

Strip graze to ensure full utilisation of that paddock of oats or pasture.

1957 Field Wheat Competition

By C. S. CLYDESDALE, Field Officer, State Wheat Board, and J. HART, Senior Adviser in Agriculture.

The value to the wheat grower of suitable varieties, crop rotation and fallowing is shown by the results of the Toowoomba Royal Agricultural Society's 1957 State Field Wheat Competition.

In this 1957 competition the overall standard of entries was, perhaps, higher than that of previous competitions. The significance of this fact can only be appreciated through a study of the 1957 rainfall data.

A summary of average rainfall as recorded by entrants is presented in Table 1.

October rainfall was not supplied. Generally it ranged from 0 to 2 in., and, in all cases fell at the end of October. By this time it was of little, if any, value to the maturing crops.

Apart from the December registrations these monthly totals were built up from a series of light showers, few of which could be classed as effective falls.

Growers' crop successes therefore were moulded around the rainfall which occurred some six months prior to sowing.

METHOD OF JUDGING.

The State was divided into five zones as in previous years (see Plate 1.). Awards were made on the following scale of points:—

A. *Estimated yield.*—1 point per bush.

B. *Trueness to type and purity.*—20 points.

TABLE 1.

	Zone 1.	Zone 2.	Zone 3.	Zone 4.	Zone 5.
1956—					
December	727	713	510	661	940
1957—					
January	437	268	307	269	472
February	308	163	92	81	187
March	185	152	214	173	193
April	55	66	62	14	8
May	..	12	7	1	4
June	139	166	124	144	109
July*	206	246	233	135	160
August	65	51	38	46	137
September	21	19	25	3	..

* Main planting month.

C. *Freedom from disease.*—25 points.

D. *Evenness of Crop.*—15 points.

E. *Condition.*—10 points.

F. *Freedom from weeds.*—25 points.

G. *Grain protein.*—2 points for every 1 per cent. in excess of 10 per cent.

THE PRIZE LIST.

State Grand Championship.

E. W. Blomfield, "Meenawarra", Cecil Plains; Variety, Spica.

State Reserve Championship.

B. D. Teakle & Son, Jondaryan; Variety, Festival.

Plate 1.

Sketch Map of South-Eastern Queensland Showing Zones of Wheat Crop Competitions. Zones 1, 2 and 3 are shown in detail, and the relative positions of Zones 4 and 5 indicated.

ZONE 1.

——	Variety.	A.	B.	C.	D.	E.	F.	G.	Total.
B. D. Teakle & Son, Jondaryan	Festival	44	18·5	23	13	9	23	9·6	140·1
L. C. Teakle, Jondaryan	Spica ..	44	17·5	23·5	13·5	9	24	8·0	139·5
Alison F. McWilliam & M. E. Coleborn, Bowenville	Festival	41	18	24	14·5	9	23·5	7·0	138·0

ZONE 2.

——	Variety.	A.	B.	C.	D.	E.	F.	G.	Total.
E. W. Blomfield, Cecil Plains	Spica ..	47	18·5	23·5	13	8·5	23	8·2	141·7
Caboola Pastoral Co. & R. Tighe, Millmerran	Gabo ..	44	18	23	13	8·5	23·5	9·4	139·4
J. E. Bligh, Brookstead	Festival	42	19	23·5	14	7	20·5	11·2	137·2

ZONE 3.

——	Variety.	A.	B.	C.	D.	E.	F.	G.	Total.
L. & G. L. Sandercock, Jimbour	Charter	42	16	23·5	13·5	7	22·5	10·8	135·3
Ian Brimblecombe, Jimbour	Lawrence	34	19	23·5	14	9	24	7·0	130·5
Ian G. Patterson, Tipton	Festival	42	17	23	13·5	7·5	19	8·4	130·4

ZONE 4.

——	Variety.	A.	B.	C.	D.	E.	F.	G.	Total.
York Bros., Wallumbilla	Festival	25	18·5	24·5	12·5	7·5	22	10·2	120·2
B. V. Doherty, Chinchilla	Festival	28	16	23	11·5	7	19	12·2	116·7
C. R. Aisthorpe, Mount Abundance, Roma	Puora ..	31	16	23	12·5	7	19	7·2	115·7

ZONE 5.

——	Variety.	A.	B.	C.	D.	E.	F.	G.	Total.
James Linney, Clermont	Spica ..	41	12	24·5	13	7	21·5	0·6	119·6
Owen K. Benn, Capella	Gabo ..	32	16	24·5	12·5	7·5	20	7·0	119·5
Robert & Hugh Dearden, Emerald	Gabo ..	32	16	24·5	13·5	8·5	21	2·8	118·3

A Test of Skill.

This 1957 competition attracted a record number of entries—166 in all. Also, for the first time the requisite minimum number of entries was received from all five zones. This was the first occasion on which growers from the Central Queensland area,

Plate 2.

Mr. E. W. Blomfield's Grand Champion Crop of Spica Wheat. Inspecting the crop are the owner, Mr. E. W. Blomfield (hatless), and Messrs. A. R. Dill, J. H. Anderson and C. J. McWilliam, Vice-Presidents of the Royal Agricultural Society, Toowoomba. (Photo. by courtesy of "Queensland Country Life").

comprising the Central Highlands and Dawson-Callide, have participated in the State Field Competition.

Such a response under weather conditions as outlined previously is remarkable. But perhaps even more remarkable is the high standard of cropping achieved under these conditions.

Therefore we feel that results this year could be more an indication of farming skill than in previous competitions. This was more evident when comparing one zone with another than when comparing one farm with another in the same zone. A zonal summary of crop results and farming practices bears out this point.

TABLE 2.

——	Average.			Percentage of Growers who practise :—	
Zone.	Yield.	Protein Per cent.	Field Points*	Long Fallowing.	Crop Rotation.
				Per cent.	Per cent.
1	33·0 b.p.a.	13·5	117	50	67
2	34·1 b.p.a.	13·0	116·5	56	73
3	35·1 b.p.a.	13·6	117	71	76
4	24·5 b.p.a.	14·6	107	17	17
5	30·0 b.p.a.	12·2	108·5	53	90

* Total points scored, less protein figures.

From a judging point of view this summary tells a story. In each of the three long-established wheat growing zones of the Darling Downs proper (Zones 1 to 3) the overall picture is similar. There is, however, a definite suggestion from these figures that fallowing pays off.

In Zone 4, there is a strong suggestion that the lower average yield may have been largely due to a relative lack of long fallowing and to the common practice of growing wheat year in year out on the same land without crop rotation. Admittedly the seasonal rain in Zone 4 was low. Nevertheless, the wide yield differences between Zones 3 and 4, for example, would not be expected from the minor rainfall differences alone.

The central Queensland growers of Zone 5, through the adoption of the recognised dry farming techniques as applied on the Darling Downs, maintained a fairly good yield average, but scored somewhat less in sections such as "trueness to type", "freedom from weeds", and "evenness". This appears to be due to the use of poor seed and to the high percentage of entries on virgin and second-crop land. Under these latter conditions lack of evenness in the crop and poor control of weeds are not unusual.

Rotations and Fallows.

In Queensland's wheat areas, crop rotation and fallowing are interlinked. Because of rainfall irregularity no rigid rotation can be laid down; and again, because of this irregularity, fallowing becomes desirable. In 1957 both practices had a marked influence on grain yields as indicated in Table 3.

Plate 3.

Another View of Mr. Blomfield's Champion Crop.

Plate 4.

Mr. B. D. Teakle in his Reserve Champion Crop of Festival Wheat.
This crop was first prize winner in Zone 1.

TABLE 3.

	Grain Yields.	No. of entries.
*Crop rotation practised	34·4 b.p.a.	88
No crop rotation practised	30·3 b.p.a.	42
Long fallow practised	35·3 b.p.a.	73
Only short fallow used	29·5 b.p.a.	63

* Crop rotation here refers to any sequence of cropping other than that of continuous winter cereals.

All indications now suggest that a suitable rotation for our grain lands should include three years out of every eight or 10 under lucerne or legume-based pasture. This may be followed by a dual purpose wheat crop. Succeeding sowings will follow the dictates of the season and will include the alternation of both summer and winter grain and grazing crops. The use of "change over" cash crops such as cowpeas and millets must not be overlooked. Linseed and barley should come into the latter end of the rotation and immediately preceding the re-establishment of lucerne or pasture. A suggested cycle is three years lucerne (or balanced pasture) to seven years grain and grazing crops.

Fallowing, of course, is part of any rotation. In Zones 4 and 5 particularly, care must be taken to select areas where the soil is sufficiently deep to hold all moisture received during the fallow period.

High Protein.

Unfortunately, grain samples for protein determination were not received from some of the entries. Accordingly, some potential zone-winning entries in both Zones 4 and 5 virtually disqualified themselves through this oversight.

Nevertheless, this section of the competition proved both interesting and instructive.

From the 101 grain samples received for protein determination a protein range of 9·9 per cent. to 16·2 per cent. was recorded. The average for all entries was 13·4 per cent.; and only two out of the total number registered less than 11 per cent.

The average protein figure of 14.6 per cent. from Zone 4 is exceptionally high. As the bulk of samples submitted here were from brigalow country, a further average of all entries from brigalow soils in all zones was taken. This average protein percentage of these samples was 15.1. Such a figure suggests that Queensland's reputation for quality wheat production is unlikely to suffer by extension of the industry to the vast brigalow belt.

Text-book Successes.

Mr. Blomfield's championship crop of Spica was produced under text-book conditions. The land was comparatively new. It had been under grazing lucerne for three years preceding this 1957 crop. Following the heavy flood rains of 1956 and the subsequent long fallow, the crop was assured of ample moisture in spite of a drought season. However, the points which clinched the championship were the combination of high grain yield and protein content—47 b.p.a. and 14·1 per cent. protein—a combination brought about through fallowing and the use of lucerne in the cropping rotation.

With the exception of crops in Zone 4, all championship and place-winning entries had two factors in common. Firstly they were all grown on long fallows and secondly they were all grown on land which had been subjected to some form of crop rotation. The adoption of these principles by Zone 4 contestants would, we believe, help to raise the cropping standards in that region.

Plate 5.

L. and G. L. Sandercock's Crop of Charter which won Zone 3. A group of Royal Agricultural Society officials are examining the crop with Mr. L. Sandercock. (Photo. by courtesy of "Queensland Country Life.")

Plate 6.

A Crop of Charter Entered by Major Bros. of Baralaba. This entry was from one of the newer grain-growing districts of central Queensland. The bottle trees are an interesting feature of the original vegetation.

In Zone 5 the practices of crop rotation and effective fallowing are already well established. However, here, as on the Darling Downs, a rotation which will maintain soil fertility will almost certainly have to be based on the recurring use of pasture grasses and legumes. A little more attention to some of the lesser details of crop production would help these farmers to improve their points scores.

The judges feel that there is no valid reason why Zones 4 and 5, with attention to the matters outlined, should not challenge Zones 1, 2 and 3 for the honour of taking the Royal Agricultural Society's Field Wheat Crop Competition.

Acknowledgements.

We would like to thank all growers for their kindness during the weeks of judging and to acknowledge the ready assistance given to us by various State Wheat Board officers and by Mr. Howard Colbert and his staff of the Royal Agricultural Society, Toowoomba.

Reducing Milk Spoilage

It is the foremilk from each teat that is largely responsible for the initial bacteria found in freshly drawn milk. Discarding this small quantity is a valuable aid in reducing spoilage.

Gympie Farmers Try Townsville Lucerne

By G. J. CASSIDY, Adviser in Agriculture.

Any summer pasture legume that shows promise is worthy of trial by individual farmers and graziers in Queensland. The need for such plants is so pressing that the Department of Agriculture is giving a great deal of attention to the problem.

Meanwhile forage plants that might economically improve the quality of off-season grazing can be used as far as possible. Such a plant is Townsville lucerne.

Townsville lucerne (*Stylosanthes sundaica*) is an annual, summer-growing legume. It bears a trifoliate leaf and in the young stages looks a little like ordinary lucerne (See Plate 1). It develops into a semi-prostrate, bushy, fibrous plant arising from a single tap-root and crown. In the Gympie district, the seed germinates with the first intensive summer rains. As a rule the plants flower during March and mature their seed about mid-May, after which they die off naturally or are killed by frost.

Townsville lucerne is a native of South America. Its accidental introduction to tropical North Queensland took place many years ago. There it proceeded to make itself at home. The climate and rainfall suited it so well that it spread rapidly from stock routes, trucking yards and along railway lines. It now provides natural high quality grazing at the end of summer in vast areas of the north. It does not seem to occur naturally south of Bundaberg.

Plate 1.

Young Townsville Lucerne Plants, Lower Wonga. Seed broadcast on lightly renovated forest pasture.

GYMPIE PLANTING.

About eight years ago a district farmer, Mr. B. Landsberg of Lower Wonga, established a 4-acre trial area. Mr. Landsberg has since planted 60 acres to Townsville lucerne—mainly with seed harvested from the initial area. In recent years successful plantings have also been made on forest country at Oakview, Kia Ora and Woondum.

Observations indicate that there are certain fairly rigid conditions which govern the growth and regeneration of Townsville lucerne.

1. *Type of Country.*—The plant, as already pointed out, is a self-regenerating summer annual. The seed is hard, and main seedling regeneration will not take place without fairly intensive rains—usually well into the summer. The seedlings will not compete successfully with vigorous grasses. They need an environment which allows a certain amount of "elbow room" for proper development. It would be useless, therefore, to oversow Townsville lucerne into a dense grass sward such as paspalum, kikuyu or mat grass. It is better adapted to poor country carrying a lightish cover of tufted native species which leave areas of bare ground between individual plants (Plate 2).

2. *Seed-bed.*—Hard or firm ground with the minimum of loose soil cover seems to constitute ideal germinating conditions for the seed.

For planting, a light renovation or scratching of the surface followed by broadcasting is recommended. Quite a satisfactory germination can be expected with no soil preparation whatever.

The recommended seeding rate of 4 lb. per acre may give a somewhat thin initial stand. Prolific seedling regeneration in subsequent seasons, however, is the reward of proper management (Plates 3 and 4).

Plate 2.

Townsville Lucerne Regenerating in an 8-year-old Stand, Lower Wonga.

CATTLE LIKE IT.

It is commonly reported from tropical North Queensland that cattle do not find Townsville lucerne attractive grazing until seeding has taken place and plants are well matured. In the Gympie district, however, the plant is eaten without hesitation at any stage of growth. For full seed production it is advisable to exclude stock from a paddock about mid-March, when flowering begins. The material is then available for grazing at the end of May—after seeding is normally finished. A full crop of seed should be encouraged every two years to maintain a vigorous annual stand.

FOOD VALUE.

Analyses of water-free material have been made available by the Agricultural Chemist (Table 1). They demonstrate that Townsville lucerne is anything but low in nutritive value.

TABLE 1.

——	Crude Protein.	Carbo-hydrate.	Fat.	Fibre.	Ash.	Lime.	P_2O_5.
Sample 1 ..	17·7	41·0	1·2	31·9	8·2	1·6	·507
Sample 2 ..	12·3	45·6	0·7	36·2	5·2	..	..

Plate 3.

Green Panic and Townsville Lucerne Pasture at Oakview. The legume has regenerated for four years in this pasture.

The plant is one of the few that provides palatable and nutritious grazing even after it has "hayed off" in the paddock. For instance, analysis of mature plants has revealed a crude protein content of 12.4 per cent. (on a moisture-free basis).

The important food value of Townsville lucerne, therefore, lies in its suitability for deferred grazing. Under the system of management described it will provide better than medium quality forage at a time when native pastures are valueless as productive feed for either beef or dairy cattle (Plate 5).

Mr. Landsberg uses his paddock for this purpose. By doing so, he has successfully extended the average lactation period of his milking herd by two months and increased his annual gross return by £200-300.

It should be mentioned also that no crop occurred during the drought year 1957. A light germination of seedlings followed intensive rains in December, 1956. These plants subsequently burnt off when no wet season occurred. At January last no annual germination had yet taken place because of continued drought conditions.

IS IT A SOIL IMPROVER?

Although it is a legume Townsville lucerne has never been considered a very efficient agent for the fixation of nitrogen through association with rhizobial bacteria. However, some quantitative data obtained at Oakview in January 1957 indicate that this plant can exert a measurable effect on soil fertility.

The yield of three separate sown grasses was measured—both in a pure stand and in association with Townsville lucerne. This made six plots in all. From each plot six quadrats (each 1 sq. metre) were cut at random and weighed for yield of green matter. Representative samples were then taken from each plot and analysed for determination of the protein levels. It will be seen from Table 2 that there is a consistent and significant increase in both overall yield and protein content of each grass species when associated with Townsville lucerne:

TABLE 2.

Species.	Av. Yield of Grass.	Crude Protein.
	Lb.	Per cent.
Green Panic—		
(*a*) With Townsville lucerne	1·75	7·3
(*b*) Pure stand ..	·45	6·5
Buffel grass—		
(*a*) With Townsville lucerne	·78	8·6
(*b*) Pure stand ..	·05	7·5
Rhodes grass—		
(*a*) With Townsville lucerne	1·28	6·4
(*b*) Pure stand ..	·61	5·9

When sampling took place in January, no Townsville lucerne existed in the plots. The samples represented grass regrowth following an accidental

spring burning of the whole area following three years of recurring Townsville lucerne growth.

These results are consistent with the experience of tobacco growers in North Queensland who find that less nitrogen must be supplied where tobacco is grown on land previously carrying Townsville lucerne.

Inoculum for seed treatment before planting is available on application from the Department of Agriculture and Stock at Brisbane, Cooroy and Gympie.

Seed is machine harvested and cleaned locally. It retails currently at 10s. per lb.

ACKNOWLEDGEMENTS.

Mr. B. Landsberg, Lower Wonga, and Messrs. N. & I. Fitzgerald, Oakview, made land and facilities available for observations and trials. Their co-operation is gratefully acknowledged.

Plate 4.

Rhodes Grass and Townsville Lucerne Pasture at Oakview. The legume has regenerated for four years in this pasture.

Plate 5.

Townsville Lucerne in its Sixth Year of Regeneration in Native Grass Pasture.

Rhodes Grass-Lucerne Pasture At Kairi

By G. W. KYNEUR, Agronomist, and P. G. TOW, Assistant Agronomist.

One of the main activities of the Kairi Regional Experiment Station is to demonstrate the suitability of a mixed farming system of land usage for the northern portion of the Atherton Tableland.

The system includes a period of pasture ley (short term pasture), and in this article the establishment of a Rhodes grass-lucerne pasture is described.

The Kairi Regional Experiment Station is situated on the Barron River, 10 miles north-east of Atherton. The surrounding district, which forms the northern portion of the Atherton Tableland, is gently undulating country with an elevation of 2,000 to 2,400 ft. This elevation in a tropical latitude results in fairly equable range of temperature and humidity.

The following table illustrates the temperature, rainfall and humidity ranges of the seasons (5-year averages):

	Spring Sep.–Nov.	Summer Dec.–Feb.	Autumn March–May.	Winter June–August.
Maximum temp.	80·1° F.	82·8	77·0	71·2
Minimum	57·6° F.	64·9	60·7	52·1
Rel. humidity (9 a.m.) ..	69·2%	75·8	83·1	84·5
Rainfall (inches)	4·53	26·82	16·89	3·54

The average annual rainfall is 51 in., of which about 75 per cent. falls during January to March. Long dry periods are usual in winter and spring. Storm rains during November and December help to relieve the effects of the otherwise hot, dry weather of these months.

Soils of the Region.

The dominant soil type on the Station, and of the region, is deep, red-brown, clay loam derived from basalt under a vegetation of rain forest. There are also small areas of alluvial soils on river flats, and some isolated areas of light-coloured soils associated with outcrops of granite.

The basaltic clay loams are very fertile in their natural state. They have a satisfactory level of plant foods, a high content of organic matter, and a well-developed structure.

A gradual decline in fertility usually occurs when the soils are brought into cultivation, and this is largely attributable to losses of organic matter through decomposition. Nevertheless the productivity of these soils will remain high if their organic matter status is maintained at a satisfactory

level. The recognition of this fact has drawn attention to the need for investigating farming systems that will ensure the maintenance of soil productivity, and yet give a satisfactory return to the farmer.

Value of Rotations.

The cropping history of the district has been mostly a story of 50 years of maize monoculture. Under this exploitive usage, and consequent loss of organic matter and deterioration of the physical condition the productivity of soils declined steadily.

In many instances accelerated erosion further contributed to loss of productivity.

These exploitive practices are now being replaced by more suitable systems of land usage, and one of the main activities of the Station is the demonstration of such a system. It is a mixed farming system involving rotational cropping which includes a period of pasture ley. Grazing animals are used both for the purpose of achieving a quicker build-up of soil fertility, and for effecting a balanced farm economy.

The mixed farming system is being demonstrated on an area of 133 acres of which about 34 acres are non-arable and under permanent pasture. The remainder is divided into nine paddocks of 11 acres each. Each year there are 33 acres of mixed pasture and 11 acres of lucerne for hay or grazing by a dairy herd of 30 milkers; there are 33 acres of maize for grain, and 11 acres of maize for silage.

The area of pasture is supplemented by one paddock (11 acres) of cowpeas for grazing and green manure, which is subsequently planted to oats for grazing during the period May-August. The maize (11 acres yielding 10-15 tons/acre) is ensiled during March and fed out from July to December.

Plate 1.

Dairy Herd Grazing Rhodes Grass-Lucerne Pasture (at right).

At left is lucerne about one month old.

Pasture.

The pasture required for such a scheme needs to be easy to establish and the seed should be readily available and cheap. A quick, early growth is required; a maximum of frost and drought resistance is essential and a high degree of palatability and nutritive value is desirable. It must, of course, include a legume component.

Two plants which measure up well to most of these requirements are Rhodes grass and lucerne. While, at certain periods of the year, Rhodes grass may not be so good in some respects as certain other summer-growing grasses, it nevertheless performs well and is considered to give the best overall results.

Plate 2.

Lucerne-Rhodes Grass in First Year. This is the same area as shown on the left in Plate 1, but one year later.

Utility of Lucerne.

Lucerne is the only perennial legume found so far which can be quickly established, resist the frosts (and these can be severe), and survive the choking competition from weeds during the wet season. In addition, it has proved to be more palatable and more easily managed than any other legume tried.

In order to obtain a good mixed pasture of Rhodes grass and lucerne, it is necessary to establish the lucerne first. If this is done on land which has been fallowed or cover-cropped during summer, a good stand can be obtained from a planting made during the succeeding April-May. The grass can then be oversown during the following wet season, or if it is desired to use the lucerne as a hay crop, the grass planting can be deferred for a year.

The lucerne can be grazed within about six months of planting provided there has been sufficient winter and early summer rainfall. When the grass is planted in January or February, the pasture may be grazed about three months later.

Lucerne growth is slow during the winter; is quite vigorous throughout spring and early summer, but is dominated by the grass during the wet season. At this time the grass is at its most unpalatable stage and runs to seed after grazing or mowing.

This cycle is continued each year of the pasture phase—with the grass increasing in density and the lucerne thinning out until, at the end of four to five years, the lucerne is not dense enough to provide the grass with the nitrogen required to produce the soft, leafy growth so desirable for dairy cattle.

Carrying Capacity of Pasture.

The carrying capacity of the rotation is limited by the winter-early summer growth period of the pasture phase. The excess summer growth can sometimes be ensiled, but because of the "stalky" nature of the material this can be a risky proposition and the waste can be excessive unless the material is first chaffed. If the winter-early summer production of pasture could be raised, then the carrying capacity could be lifted accordingly.

The aim is to sow lucerne during autumn to avoid a fresh germination and growth of summer weeds but at the same time early enough to set good growth, utilising sub-soil moisture, before the onset of winter.

Seedbed Preparation for Lucerne.

A crop of giant setaria (*Setaria italica*) for grazing or maize for silage is suitable for weed control and land utilisation during summer. With the former, flowering and seed setting take place about six weeks after planting so that early ploughing for preparation of the lucerne seedbed can be carried out provided the rainfall will permit it. Silage maize is a better weed-controlling crop but its season is longer and the soil is left in a compacted state from the traffic of silage-making operations. The short time available and the hard soil could be unfavourable for satisfactory seedbed preparation.

The first ploughing should be completed no later than mid-March. This should be as deep as possible. Ideally, two ploughings are desirable if the first can be completed during February. Working with disc or tine cultivators is necessary to destroy weed growth and obtain the desired tilth.

The worst summer weed would normally be wild gooseberry (*Nicandra physalodes*), of which a fresh germination follows each cultivation until the first frost. If no frosts occur, the weed will continue to germinate and grow until the hot, dry spring weather kills it out. (The seeds of this plant will lie dormant in pasture land for at least five years to produce fresh growth in the following maize crop.)

Autumn and winter weeds such as couch grass (*Cynodon dactylon*), Mexican poppy (*Argemone mexicana*), wild radish (*Raphanus raphanistrum*) and species of *Ageratum* can be serious pests It is not desirable to prolong the cultivation period in order to eradicate these as the soil moisture level would then be unsuitable for lucerne planting.

Planting Lucerne.

The best planting time is considered to be about the last two weeks of April. Sub-soil moisture is usually ample at that time and the usual light "drizzle" showers will wet the surface down to the zone of moist sub-soil. These conditions are not always present, however, and planting may have to be delayed until as late as June. Plantings later than June are not recommended unless irrigation facilities are available.

With the land clean and level, planting is most efficiently carried out with the seed drill. The seed is first inoculated with a suitable strain of rhizobium. This requires a little extra effort but it is worthwhile to avoid the risk of poor early growth, due to faulty nitrogen fixation, especially on soil of low nitrogen content.

The depth of planting should be about ½ in. to 1 in. and a set of spiked or chain harrows trailing behind the drill should give adequate cover and help to level the soil.

The usual rate of planting is 8 lb. per acre. Higher rates up to 12 or 15 lb. per acre can be used where the

soil fertility is high and the ground reasonably weed-free. The "Hunter River" strain of lucerne is used.

The cold, dry winter weather following planting usually results in retarded growth, but the weeds—Mexican poppy, wild radish and couch grass—continue to flourish. Mowing will help to control the first two until they die out in the spring.

It is during the spring, following the early storms, that the lucerne crop makes its best growth and it may be possible to make a cut of hay or graze it off then. However, the crop should be at least 6 in. tall for grazing and 10 to 12 in. tall to make a hay cut worthwhile.

Grazing Lucerne.

To get best results from grazing the lucerne, an electric fence should be used and the crop rationed daily, according to the requirements of the herd.

The "wet" season brings vigorous growth of the lucerne along with a fresh crop of summer weeds such as crowsfoot grass (*Eleusine indica*), wild gooseberry, couch grass and species of *Malvastrum*. The lucerne is usually hidden from view for about three months and the effect of this competition coupled with the selective grazing usually results in a much depleted stand emerging to commence its second year.

Ideally, the lucerne should be maintained for a second year in order to provide some grazing and hay for storage and drought feeding. The growth during the second year is more vigorous but the weed infestation in the second summer is often worse than in the first.

Haymaking Limited.

If the crop is kept for hay, a quantity of only one ton or so per acre per year can be expected because, under the climatic conditions of the

Plate 3.
Pure Lucerne Stand One Year Old, Heavily Infested with Crowsfoot Grass.

district, periods suitable for hay-making are very limited. Suitable hay-making weather occurs only during June to August, and again from late October to December. The summer growth is quite unsuitable for hay-making—up to 80 to 90 per cent. of this crop may be weed growth, and periods of hot, dry weather are most infrequent.

The average life of a pure lucerne stand would be about four to five years, after which the stand would be too thin for economical hay-making.

If the surface has not been heavily compacted by animals or traffic, a cultivation with the disc harrows, heavily weighted and with full set on the discs, is usually sufficient to cut all surface growth down and loosen the soil sufficiently to permit the sowing and light covering of the Rhodes grass seed. This treatment also causes the least amount of damage to the lucerne.

A spring-tine cultivator fitted with lucerne points can be used if greater penetration is desired or the surface is too compacted to permit satisfactory working by the disc cultivators. However, the tines may damage the lucerne more severely. If weed growth is heavy the tines have a tendency to build up heaps of plant and soil material, and there may be many large weeds which may not be dislodged by the tines.

This preparation is usually done in damp soil immediately preceding planting.

Plate 4.
Rhodes Grass Six Weeks Old Competing with Wild Gooseberry.

Establishment of Rhodes Grass.

In the rotation system as practised at the Regional Experiment Station, the pure lucerne is oversown with Rhodes grass during the first or second summer following establishment of the lucerne.

Rhodes grass is relatively easy to establish even on hard ground or a very rough seedbed. It requires only a light covering, but rain during or immediately following planting does more than anything else to ensure a good strike. It is not necessary, therefore, to undertake any intensive programme of land preparation. In fact, the whole aim is to disturb the soil as little as possible in order to avoid damaging the lucerne.

Seed Planted with Drill.

The use of the seed drill for planting seems to give the best results. Rhodes grass is a very light, hairy seed and will not run through an ordinary grass seed box. However, good distribution can be obtained if

equal volumes of seed and dry sawdust are mixed and the mixture put through the fertilizer box. Such a mixture would contain about one third by weight of grass seed.

Rate of Planting Rhodes Grass.

The usual rate of planting for Rhodes grass is six to eight lb. of seed per acre, so that the drill should be set to deliver about 21 lb. of the mixture per acre.

The delivery tubes are removed and the seed allowed to float down to the surface. A set of chain harrows, leafy branches, or stump-jump pasture harrows trailing the planter will usually give the necessary cover—about $\frac{1}{2}$ in.

The best time to plant is well into the wet season—usually mid-January —and, if possible, while it is raining.

If conditions are favourable, germination should commence within six days, when the tiny green shoots should be noticeable. But full germination may be spread over two weeks or more. The Rhodes grass seedlings are very difficult to distinguish from grass weeds such as Mossman burr (*Cenchrus echinatus*). couch, crowsfoot, and summer grass.

Grazing and Management of Rhodes Grass.

Under normal conditions, and in spite of heavy weed competition, the young grass should make quick growth and is often ready for grazing within three months of sowing or sometimes less. Within that period the grass will often reach a height of 10-12 in.

Plate 5.

Rhodes Grass in Its First Year.

consisting of dense, vigorous plants firmly held in the soil.

Growth is retarded through the winter and early spring, but the early summer storms and heat result in lush, leafy growth of both grass and lucerne. It is during this period that the pasture is at its best.

The method of management of this pasture is most important. As the fodder is required for dairy cows, the quality must be maintained at a high standard for as long a period as possible, and the aim is to improve the palatability at times when the grass is usually rank and coarse, which would be from February to September.

The main method of management is centred on the use of the grazing animals. If they are given access to the whole paddock, then they will selectively graze the young, leafy plants, and avoid the coarse ones. At the end of the year the pasture would

consist mainly of coarse clumps of Rhodes grass with very little lucerne. But, if the stock are confined to a small area for each grazing, these bad effects can be more easily avoided and a fresh, leafy growth can be made available for each grazing.

The most convenient method of achieving controlled or rotational grazing is by means of electric fences which can be readily moved and quickly installed. Of course, electric fences are not of much use in paddocks which are not of suitable size and shape or are not adequately watered.

Handling Excess Growth.

During the wet season, Rhodes grass produces more feed than the cows can eat. This surplus soon becomes coarse, rank and very unpalatable and has to be removed in order to encourage palatable leafy re-growth. The usual procedure is to mow it. It may be possible at times to ensile the unwanted grass, and, if a satisfactory silage can be made, an excellent fodder reserve will be available for use during periods of poor pasture growth.

Unprotected "wedge" or "bun" silos are not advocated. Although they take the least amount of trouble and time to make, the long stalks of the grass are so difficult to compress that wastage is very high and the silage is usually of poor quality and low palatability. If the material can be chaffed into a pit or trench silo a much more satisfactory type of silage can be made.

The surplus growth may also be removed by a rotary cutter or slasher of a type which will mulch the material and not leave it in long lengths. The latter type of material makes renovation very difficult and is a nuisance if it is desired to make hay or silage at a later date. If an ordinary reciprocating mower is used, the long material needs to be carted off or else chaffed up with a forage harvester or similar machine and returned to the

Plate 6.

Trench Silo (Prior to Covering) Filled with Chaffed Rhodes Grass and Lucerne.

paddock. It is most desirable to retain the excess on the surface in the form of a mulch to cover any bare areas and help conserve moisture.

discing to break up any clods and level the ground is recommended. Such operations should be done while the soil is moist and preferably during

Plate 7.

Lucerne-Rhodes Grass in Fourth Year. This is the same area as shown on the right of Plate 1, but one year later. The area has been renovated with tines penetrating to a depth of 3 to 4 in.

During the intensive grazing of the wet season period, there is the usual build-up of dung pads and a compaction of the surface soil. The latter condition can have bad consequences in that, although it does not seriously affect the pastures, the area will be more liable to shed heavy rainfalls and cause erosion in less stable paddocks lower down the slope.

Renovation of Pasture.

In order to spread the manure and renovate the soil, working with a tined implement followed by a light

wet or cool, cloudy weather. These precautions are advised in order to promote quick regrowth of any dislodged grass or lucerne plants. A penetration to a depth of 3 in. is desirable, with tines spaced at about 2 ft. apart. A deeper working would be preferable, but may disturb too large an area of surface and kill pasture plants.

The use of fertilizers and farm yard manure may also help greatly to prolong the growing season of the pasture and these aspects are at present under investigation.

[TO BE CONTINUED.]

ONION GROWERS PLEASE NOTE

Current regulations require onions to be marketed in two grades:

A. No. 1 grade (to include first quality large and first quality table), as set out in *Queensland Agricultural Journal,* May 1, 1958; and *B. Picklers.*

Dairy Rubberware and its Care

By W. C. T. MAJOR, Dairy Technologist.

Tests made of the rubberware used in milking machines have resulted in some important findings that will be of use to the dairy farmer.

Persistent reports have been received of farmers' dissatisfaction with the performance of their milking machine rubberware—particularly the inflations. Also the high percentage of bacteriological defects recorded in dairy produce is causing some concern.

It has been well established that unclean rubberware—particularly fat-saturated rubberware—is a potent source of contamination, and results in the spoilage of dairy products. In addition, defective inflations cause inefficient milking, which not only wastes time, but can, in extreme cases, reduce the yield of cows.

SURVEY MADE.

In order to assess the importance of claims that inflations were inferior, a survey was made, and the inflations analysed. The survey showed that 78 per cent. of the inflations examined contained unduly high percentages of fat. It also showed that, on occasions, enormous amounts of fat were absorbed.

This defect may be due to one or more of the following factors:—

(1) The inflations may have been manufactured from an unsuitable type of rubber with a high rate of fat absorption. (Plate 1.)

Plate 1.

An Unsatisfactory Type of Rubber. The inflation on the left was removed after two milkings. The inflation on the right was unused.

(2) The rubberware may not have been effectively cleaned on the farm immediately after every milking, or it may have been unduly exposed to direct sunlight, tension, or copper contamination.

(3) The rubberware may have been used long after it should have been replaced by new rubberware.

The suitability of the unused rubberware is partly beyond the control of the dairy farmer, insofar as he can only purchase the most suitable rubber manufactured. All dairy rubberware sold in Queensland must be branded to indicate the name of its manufacturer. Farmers can,

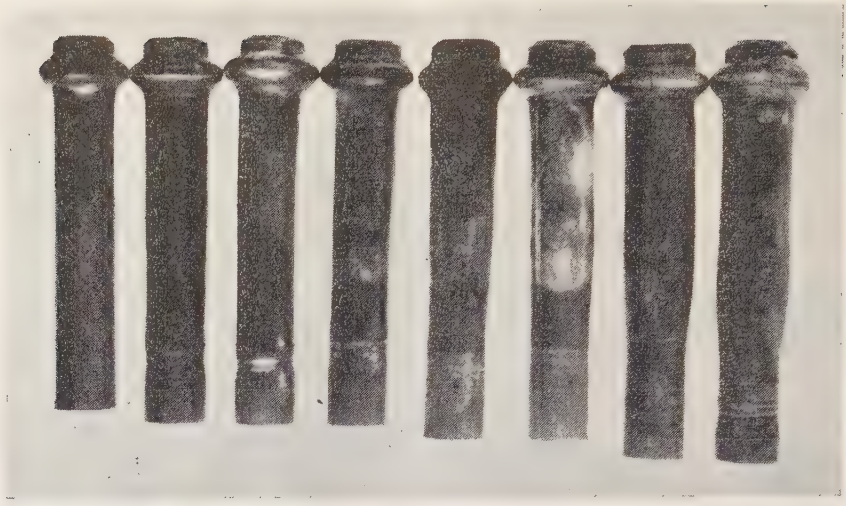


Plate 2.

Inflations Wholly Synthetic and Part Synthetic/Part Natural After 28 Weeks' Use. The inflations, from left to right are: (1) Unused; (2) 100 per cent. synthetic; (3) 95 per cent. synthetic; (4) 90 per cent. synthetic; (5) 85 per cent. synthetic; (6) 80 per cent. synthetic; (7) 75 per cent. synthetic; (8) 50 per cent. synthetic.

therefore, protect themselves by buying only those brands which they have found give satisfactory performance.

The cleaning and the care of dairy rubberware is within the control of the dairy farmer. Its discard at the end of its effective working life is also a matter for the dairyman.

TYPES OF RUBBER.

The dairy farmer can purchase rubberware made either from natural rubber, synthetic rubber, or various blends of these two products.

Natural Rubber.

Natural rubber is prepared from the latex obtained from the rubber tree. It possesses qualities such as softness and elasticity which make it ideal for use on milking machines. However, natural rubber is readily attacked by milk and other animal fats. When attacked, it looses its elasticity. It swells, becomes slack and flabby. It eventually becomes sticky. To retard this attack inert fillers such as carbon black and kaolin are added during manufacture. They fill the pores of the rubber matrix and so prevent the rubber filaments from coming into contact with fats and oils. It is therefore important that fine, insoluble fillers be used, that the rubber be completely filled without being "overfilled", and that the finished product has a smooth, glasslike surface.

It is equally important that the rubberware be thoroughly cleaned immediately after every milking to reduce fat attack to a minimum, as well as, of course, reducing bacterial contamination of the milk and cream produced on the farm.

Synthetic Rubber.

There is a big range of types of "synthetic" rubber, but very few offer possibilities for use on milking

machines. Those synthetics which may be useful must:—

(1) Be relatively inexpensive and readily available.

(2) Be resistant to the destructive actions of milk and milk solids.

(3) Have a softness, elasticity, and resistance to tearing, cutting, and permanent distortion comparable with the best quality natural rubber.

(4) Have resistance to cracking due to flexing, stretching and light.

(5) Retain these properties throughout their working life. If the plasticiser used to obtain these desired properties leaches during use the compound becomes progressively harder, more rigid, and less suitable for use.

(6) Not impart any odour or taste to milk or cream.

(7) Be resistant to the action of the various chemicals used during cleaning and sterilizing.

(8) Be capable of being manufactured in such a manner as to produce a smooth, glasslike surface.

Of these synthetics field tested to date, none has given 100 per cent. satisfaction, although one has given some remarkable performances. On a farm milking 16 cows per set of cups for an average daily production of two gallons of milk per cow, a set of bulb top 100 per cent. synthetic inflations were unaltered after seven months' use. During this period, eight sets of natural rubber inflations were used and discarded as unfit for further use. The "natural" inflations were used on a set of cups in the same shed and operated under the same conditions. However, the resistance of this synthetic to tearing and cutting is not comparable with that of good natural

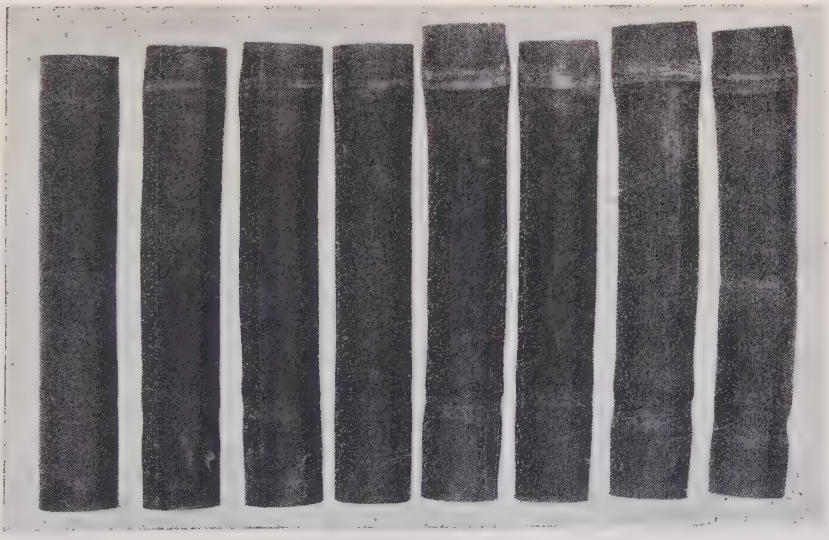


Plate 3.

Alteration in Part Synthetic/Part Natural Rubber Inflations during First Eight Weeks in Use, 75 per cent. Synthetic, 25 per cent. Natural. The period in use, reading from left to right is as follows: (1) One week; (2) Two weeks; (3) Three weeks; (4) Four weeks; (5) Five weeks; (6) Six weeks; (7) Seven weeks; (8) Eight weeks.

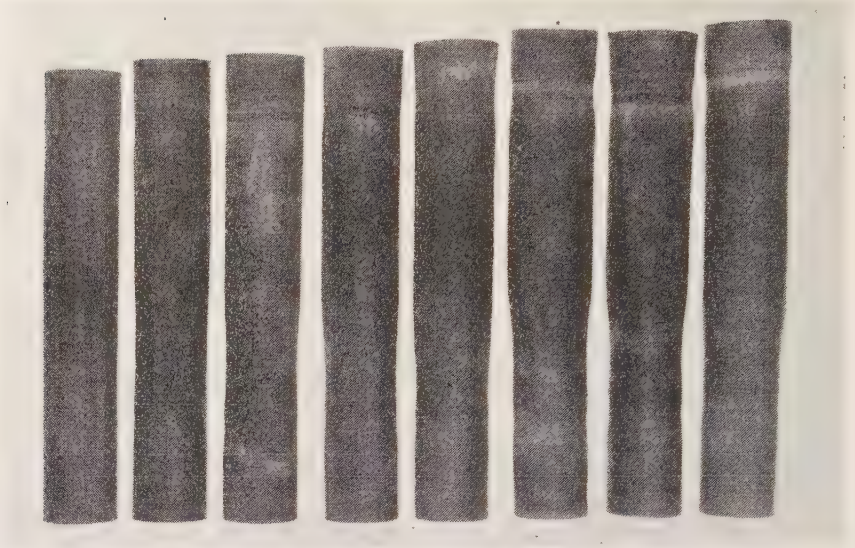


Plate 4.

Alteration in Part Synthetic/Part Natural Rubber Inflations during the First Eight Weeks in Use, 25 per cent. Synthetic, 75 per cent. Natural. The period in use, reading from left to right is as follows: (1) One week; (2) Two weeks; (3) Three weeks; (4) Four weeks; (5) Five weeks; (6) Six weeks; (7) Seven weeks; (8) Eight weeks.

rubber. Too many inflations tore, in this, and in other test dairies, either while being assembled, or during the first or second subsequent milking. Those inflations surviving these early hazards, however, were markedly superior to natural rubber inflations.

Blends of Natural and Synthetic Rubber.

Plate 2 illustrates the influence of the composition of the blend on distension during use.

As the percentage of natural rubber in the blend increases, so the life of the inflation decreases. The inflations in Plate 2 had all been in use for 28 weeks, although those containing more than 10 per cent. natural rubber would normally have been replaced long before this time. Those inflations containing more than 50 per cent. natural rubber became unusable before the conclusion of this trial at 28 weeks.

In an earlier trial, the advantage of including large amounts of synthetic in the blend was demonstrated. The inflations were removed after being in use from one week up to eight weeks. Plates 3 and 4 illustrate these results.

CARE OF RUBBER.

The most important factor is thorough, twice-daily cleaning. It is just as important to clean the outer surfaces of tubes and inflations as it is to clean those surfaces over which milk flows. It is particularly important that the mouth of the inflations be cleaned. This is well illustrated in Plate 7, which shows the mouth and side views of the same inflations. The exterior of the mouth of the natural rubber inflation is very badly cracked, although the walls show no distortion. This breakdown is associated with stretching and fat. The cracking has been accelerated by light. The inner surface of the mouth

did not crack. It may also be noted that the synthetic inflation used under the same conditions did not break down. A satisfactory twice-daily cleaning routine is as follows:—

Step 1.—Immediately the milking finishes rinse all of the equipment with water at 90 to 110 deg. F. It is most important to prevent milk solids drying on to the equipment. Once a dry film of milk solids forms it is difficult to remove, whereas it is easily removed while still wet.

Step 2.—Draw through each unit one gallon of water, the temperature of which is 180 to 190 deg. F. when it enters the machine. This water is to contain an approved detergent, such as sodium metasilicate, at the rate of one teaspoonful (level) per gallon, and also ¼ teaspoon of a wetting agent (such as Teepol, Santamers, Stanvac, Lissapol, Comprox). The torpedo brush is drawn through the milkline during cleaning. The airline is also flushed. The outside surfaces of the rubber tubes, mouths of inflations, and the remainder of the utensils are brushed in this solution at 120 to 140 deg. F.

Step 3.—Draw one gallon of very hot water through each unit of the machine. This water should enter the machine at 190 to 200 deg. F. The rubberware and the remainder of the utensils are similarly rinsed. The objects of this rinse are:

(*a*) To remove final traces of milk solids and traces of the cleaning compounds.

(*b*) To heat the equipment to:

(i) kill bacteria, and

(ii) permit rapid and complete drying of the surfaces to deter subsequent microbial growth.

Objectional deposits build up on the equipment under some conditions, such as:

(i) The use of hard water.

(ii) The use of unsuitable detergents.

(iii) Delay in commencing step 1.

(iv) Omission of step 3.

(v) Restricting the amount of water used.

(vi) Using the water too hot in step 1.

(vii) Using the water too cold in steps 2 and 3.

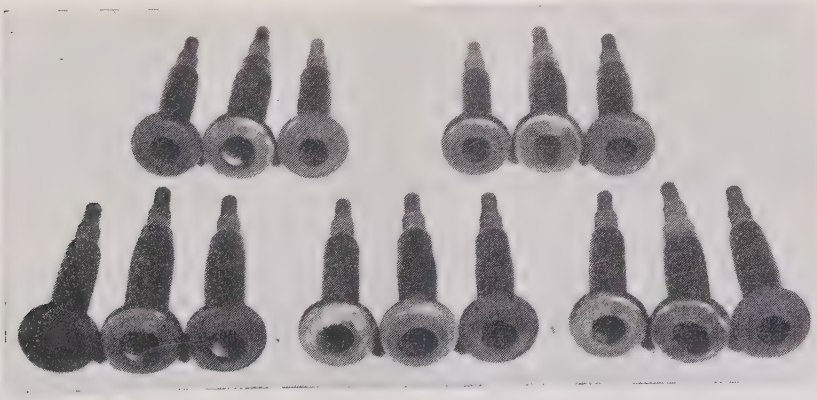


Plate 5.

Influence of Type of Rubber on Suitability of Inflations, Mouthpiece View. The central inflation in each of the five groups is wholly natural rubber and the other inflations are mainly synthetic. The inflations had been in use for 12 weeks.

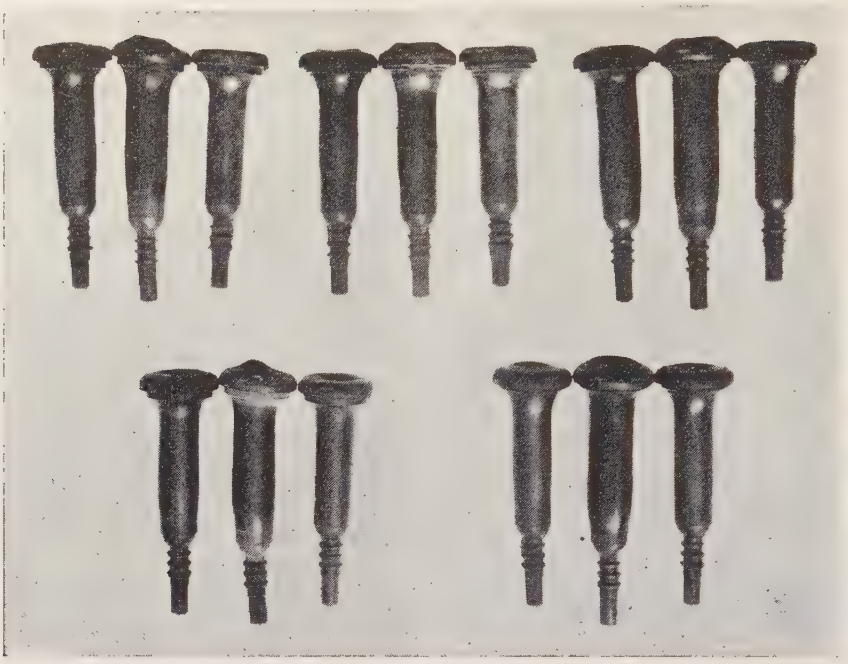


Plate 6.

Influence of Type of Rubber on Suitability of Inflations, Side View. The central inflation in each of the five groups is wholly natural rubber and the other two inflations are mainly synthetic. The inflations had been in use for 12 weeks.

These deposits can be softened by a mixture of nine fluid ounces of spirits of salts added to two gallons of water at 190 deg. F. Pipes may be either plugged and filled with this solution or the acid solution can be recirculated through the plant (in the manner set out in the November, 1956 issue of the *Queensland Agricultural Journal,* pages 649 to 652).

The solution is followed by a solution containing 2 level tablespoons of sodium metasilicate per gallon. The equipment is then taken to pieces, brushed and spent parts renewed.

Light and tension accelerate breakdown. This is noted where a tube is stretched over a metal claw, downdrop, tap, or other fitting. Breakdown occurs here before it occurs in the unstretched body of the tube. Bending and kinking also accelerate cracking.

Care of rubberware can, therefore, be summarised in the following rules:—

1. Always thoroughly clean the rubbers immediately after every milking.

2. Buy rubber designed to fit your plant without undue stretching.

3. Do not expose rubberware to direct sunlight.

4. Protect rubberware from vaseline, petroleum jelly, and other mineral oils and greases. They also attack rubber.

5. Keep metal fittings well plated. Copper from brass fittings will accelerate rubber breakdown.

6. Buy a brand that gives satisfaction.

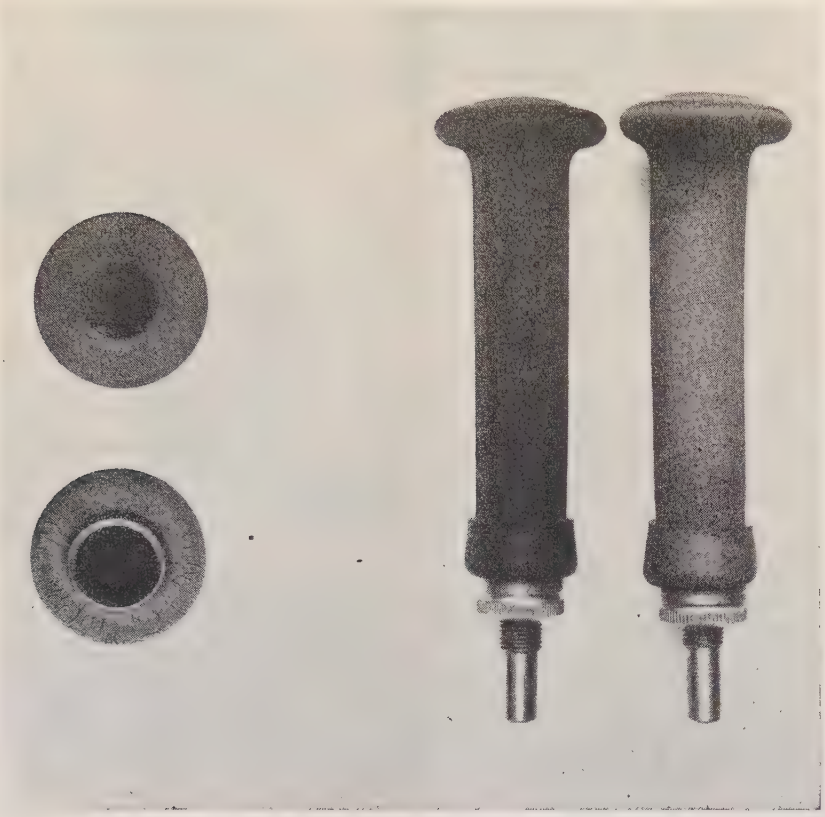


Plate 7.

Comparison of Synthetic and Natural Plain Inflations. The synthetic inflation is above the natural inflation in the mouthpiece view, and the left in the side view. Both had been used for four weeks in the same set of cups. The natural rubber mouthpiece was deeply cracked on the exposed stretched surface. It showed only hairlike cracks on the inner, shaded surface. Neither surface showed any trace of cracking with the synthetic inflation. In neither case was the wall distended. The natural rubber inflation showed signs of cracking at seven days, when it normally would have been "end for ended". (It was retained for comparative purposes only. Continuing to use the inflation until it is cracked to the extent shown is not recommended.)

Australian Tractor Test

● **Copies of the Australian Tractor Testing Committee's report on the Zetor Super Diesel tractor are obtainable from the Department of Agriculture and Stock.**

Dr. Summerville Appointed Under Secretary

Dr. W. A. T. Summerville has been appointed Under Secretary of the Department of Agriculture and Stock. He will be succeeded as Assistant Under Secretary (Technical) by Mr. W. Webster, who has been Director of the Department's Division of Animal Industry since 1947.

Announcing the appointments, the Minister for Agriculture and Stock (Hon. O. O. Madsen, M.L.A.) said that he was very pleased that such an experienced technical administrative officer as Dr. Summerville was available to direct the operations of the Department. Dr. Summerville had been with the Department for 36 years and his wide experience in research and administration was supported by studies and investigations in numerous overseas countries.

Mr. Madsen said that Mr. Webster also was a most experienced officer, having had over 30 years' service in livestock husbandry in New South Wales and Queensland. Since coming to Queensland he had concentrated on building up the Department's Division of Animal Industry. Mr. Webster had investigated cattle tick and other problems at experiment stations in U.S.A., England and South Africa. He had also undertaken assignments in India and New Zealand.

JOINED DEPARTMENT IN 1922.

Dr. Summerville joined the Department in 1922 and has occupied positions of Entomologist, Senior Plant Physiologist, Director of Horticulture, Director, Division of Plant Industry and Assistant Under Secretary (Technical).

He has served continuously with the Department and has made two extensive visits to overseas countries including the United Kingdom, U.S.A. and Canada, European and Middle East countries.

In his early departmental years he was associated with research on fruit and vegetable crops but since World War II he has concentrated largely on pasture research work.

In 1944 the University of Queensland conferred its highest scientific degree on Dr. Summerville—that of D.Sc. This was in recognition of his research in the field of plant physiology.

His more recent activities have been the direction of research on pastures, wheat and tobacco, and as a member of the Bureau of Investigation he has assisted in the overall planning of the development of the land and water resources of the State.

He is a member of the Senate of the University of Queensland and of numerous boards and committees connected with furthering agricultural development. He is immediate past President of the Australian Institute of Agricultural Science.

Laidley Cows Average 358 lb. Butterfat

By M. A. T. PATERSON, Dairy Officer.

With 358 lb. of butterfat per cow, Mr. H. M. Waite's Laidley Valley herd top-scored for Queensland in its group in the drought-ridden 1956-7 recording year.

Mr. Waite's Brooklodge Stud produced 312 lb. of butterfat per cow in 1953-54, 297 lb. in 1954-55, 350 lb. in 1955-56 and 358 lb. in 1956-57. The herd is put at the top in the Lockyer district and is one of the leading herds in the State.

During 1956-57 seventeen cows produced an annual average of 358 lb. butterfat over lactations averaging 298 days, which compares well with the State level of 149 lb. over an average lactation of 230 days.

With this production the Brooklodge herd topped the Laidley recording unit at each monthly test.

Continuous recording under the Pure Bred Production Recording Scheme has been carried out on this property over the past five years. Under it Mr. Waite raised butterfat production from 2,729 lb. from nine cows in 1953-54 to 7,212 lb. from 21 cows in 1955-56. Production from 21 cows for 1956-57 was 6,974 lb.

By sound farm management he has increased the carrying capacity of his farm. Butterfat per acre has been increased from 50 lb. in 1953-54 to 129 lb. in 1956-57.

LAYOUT OF FARM.

This farm, comprising 54 acres of heavy black alluvial flats is situated near Laidley Creek, and is subdivided into 13 paddocks of improved flood irrigated pasture, cultivation and native pasture.

Plate 1.

Cows Grazing on Irrigated Pasture.

Valuable areas of high quality pasture are readily available for grazing. In early 1953, an area of six acres was sown to the following mixture per acre:

Irrigation White Clover ..	1 lb.
Rye Grass	2 lb.
Phalaris Tuberosa	2 lb.

This area was subdivided into six ½-acre and one 3-acre paddocks, the aim being to dairy farm wholly on improved pasture and to grow lucerne for winter feeding. A future improvement will be to establish more flood irrigated pastures. Improved pastures have brought an indirect benefit to this property. The clover species are spreading over the farm and are becoming firmly established throughout the native grasses. Their action on the native species has promoted a better growth and colour in the pastures.

Cultivation of crops has not been undertaken to any extent, although, occasionally, a crop of oats or panicum is grown to supplement the pasture.

PASTURE MANAGEMENT.

Cows are grazed continuously on the pasture. To utilize feed efficiently both strip and rotational grazing have been adopted. Overgrazing is guarded against because of the major disadvantages of drop in pasture quality —this being most important in this State where the soil temperature is high during the summer months. This step is taken in view of New Zealand results where a pasture height of 4 in. is regarded as the minimum. A quick regrowth is assured when over-grazing is not practised.

Paspalum pastures are mowed to prevent seeding and to promote valuable regrowth. The cut material is left to decompose and build up the supply of humus. Burning of cut, rank growth never takes place on this farm.

Spray line and flood methods of irrigation are employed and pastures receive regular applications of water drawn from a nearby bore. Renovation and fertilizing is undertaken when necessary.

FEEDING.

As Mr. Waite takes pride in the high production of the pure bred Jersey cows, he believes in providing adequate feed. By continuous pasture feeding during the day, combined with supplementary feeding in the bails, his herd has been able to produce at a high level.

A supplementary ration of crushed grain is fed on a proportional basis to each cow during milking. Feed boxes have been installed in the bails. When purchasing grain the cost per food unit is given careful consideration. During the winter period when the pasture growth is slow the milking herd receives a ration of lucerne hay in addition to the crushed grain.

New born calves receive a good start in life and a sound calf-rearing programme has been adopted. Cows approaching calving are also fed well to ensure that they are in fine fettle when the calves arrive.

An adequate supply of bore water is provided for the herd. A windmill delivers water to a trough located near the dairy and another trough centrally situated on the pastures is supplied from the pasture bore.

HERD MANAGEMENT.

Mr. Waite believes that the basis of sound herd management is production recording. The results of production recording enable him to readily assess the effect on productivity of all his husbandry practices, namely, feeding, breeding and management.

Adequate breeding records are available because services are strictly controlled by segregating the bull into a special bull paddock. Cows are hand-mated, and calve during the

spring to enable use of summer flush growth during late lactation. This has led to a lengthy lactation with a corresponding increase in production. He has endeavoured to eliminate calvings during the January-March period (first quarter), but occasionally, when it has happened inadvertently the production of the animal has been well below that of the remainder of the herd.

Cows are fed in the bails during milking and while this is in progress udders are hand-massaged to assist in the milk let-down process. Rarely has it been necessary to resort to hand-stripping after the removal of the teatcups. Often, udder abnormalities are detected in this way, and should mastitis be suspected, remedial measures are promptly applied.

As these cows are pure-bred animals, they are regularly clipped and groomed in order that they can participate in the country shows during winter. As a result, all the milking cows are rugged at night to protect them from the cold weather. During summer the cows are regularly sprayed to reduce tick infestations as the resultant effect on milk production is well realized by the owner.

Culling, based on herd recording results, is carried out on this farm. Here again, as these cows are pure bred animals, due consideration is given to type and conformation before a final decision is made. Animals which do not conform to type are culled from the herd even though their production records are above the age standards. By this method a high standard of breeding has been maintained.

BREEDING PROGRAMME.

Every cow in the Waite herd is a descendant of "Brooklodge Creole", a Queensland record holder with 654 lb. butterfat as a 4-year-old to her credit. Line breeding is practised on this farm. Three of the last four sires used were Meritorious Sires. The bull "Ellerdale Designer's Mariner" has had the most influence on the herd; 14 animals of the present milking herd of 21 are his daughters, and of

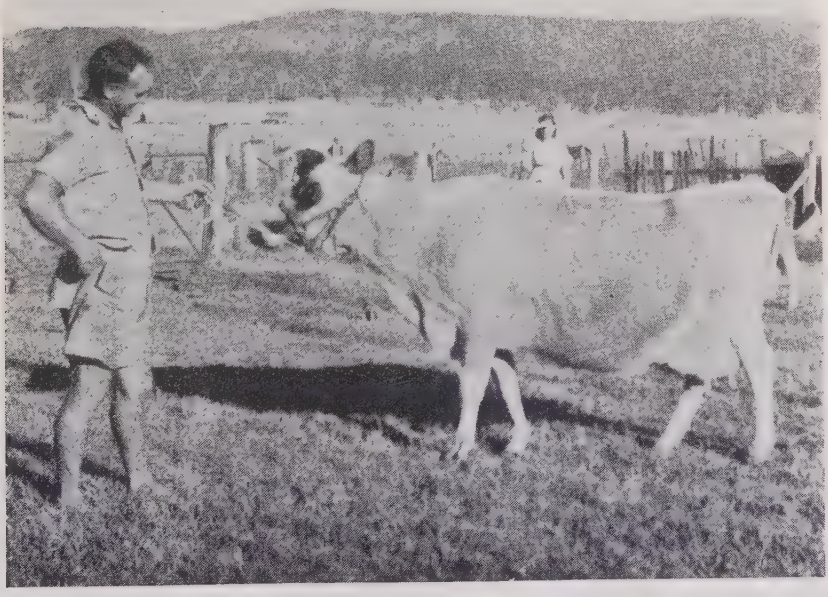


Plate 2.

"Brooklodge Brilliant" Last Year Produced 8,310 lb. Milk, 5.4 Per Cent. Average Test, and 447 lb. Butterfat in a 300-day Lactation. This cow is also in the Lifetime Register of Merit.

a total of 37 females on the farm, 17 are his grand-daughters.

In 1956-57 eleven daughters of this bull were recorded under the Pure Bred scheme. They were all under five years of age and their production average was 349 lb. butterfat. Five two-year-olds averaged 319 lb., three three-year-olds 316 lb., and three four-year-olds 430 lb.

Mr. Waite has chosen a son of this bull as his next herd sire. The dam of this young bull, "Brooklodge Brilliant Fox" is "Brooklodge Brilliant", who is a Lifetime Merit Register Cow. She produced 2,357 lb. fat in six lactations. She is also the winner of many show championships.

The main aim has been to breed from cows that have high production records and have produced over long lactation periods. Herd replacements are selected only from cows that meet these requirements.

IMPROVE WOOLSHED LIGHTING

Plenty of lighting is essential in a woolshed, and in no part of the shed lay-out is this more necessary than at the classer's table.

The accompanying plate shows a simple, easily erected device that is used to increase and concentrate indirect lighting for the classer's table in the shearing shed of a New England (N.S.W.) merino stud sheep property.

The device is made in the form of a box-shaped funnel of bondwood, open at both ends, and expanding towards the skylight situated in the roof above. The lower end of the box is about 8 ft. above floor level, and measures about 3 ft. 6 in. by 4 ft.

The amount of sunlight entering the shed above the classer may be regulated by a shutter at the skylight, and is concentrated towards the wool table by indirect reflection from the inside of the box. The inside walls of the box are painted light green pastel shade with a matt finish, which reduces glare.

—K. E. WELLS, Assistant Husbandry Officer, Sheep and Wool Branch.

Choosing A Tickicide

By B. PARKINSON, Divisional Veterinary Officer, Maryborough.

The array of tickicides now available may be somewhat confusing to farmers; quite often the question is asked, What preparation is best to use?

Up to 10 years or so ago the reply was easy, as arsenic was the only tickicide available, but today many factors must be considered before an answer can be given.

From the following data, farmers should be able to choose the tickicide to suit conditions on their properties.

The ideal requirements of an efficient mixture may be listed as follows:

1. Ability to kill ticks at all stages of their life cycle at an economical concentration.

2. Non-toxic to stock and humans.

3. High residual effect, that is, ability to keep on killing after application.

4. Stability, particularly in relation to a dipping vat.

5. Economy.

6. Ease of mixing and management.

Unfortunately, no preparation can meet all these requirements. Each must be measured against what is most desired of it.

TICKICIDES AVAILABLE.

Chemical structure defines three main groups:

1. Arsenic.

2. Chlorinated hydrocarbons.

3. Organic phosphates.

(1) Arsenical Mixtures.

Arsenic is still the chemical most commonly used for tick control. About 60 per cent. of all dips are still charged with arsenic. Bearing in mind its limitations, it can be used quite successfully. Its use is recommended more for grazing cattle than for dairy herds.

The advantages of an arsenical mixture are:

1. It is the cheapest tickicide available.

2. It is stable in dips. This is an advantage where dips are used irregularly, as no settling out occurs.

3. It is easy to mix. There is no need for stirrers. A dip-side test can be made to determine the strength at the time of dipping. Topping up can then be carried out accordingly. A periodical laboratory check for oxidation is relatively simple.

4. All stages of the life cycle of the tick are susceptible (that is, if resistance does not occur).

Disadvantages can be set out as follows:

1. It has caused many deaths. Usually, the human element is more at fault than the preparation. When arsenic is used correctly, death rarely occurs, but it is often mishandled. Carelessness in mixing is common. Greater strengths than those recommended are used with resultant losses. The manufacturer's directions should be followed correctly. If in doubt, do not use it. Heated or thirsty cattle should not be dipped. Avoid dipping in showery, humid weather. Cattle should be handled quietly for several days after dipping.

2. Arsenic has no residual effect on the beast. Dipping at intervals of 14–21 days is necessary to give adequate control if tick worry is severe.

3. Resistance of ticks commonly occurs and has become widespread in the last 15 years or so. This commonly leads to deaths, where, in order to obtain a kill, the strength is increased well above the safety limit.

If arsenic fails to control your ticks at the recommended strength, do not make it stronger. If you do, you are asking for trouble. Instead try a newer tickicide.

(2) Chlorinated Hydrocarbons.

This term covers a range of insecticides and includes DDT, BHC (or gammexane), toxaphene, chlordane, dieldrin and aldrin. All are basically related in chemical structure, but DDT differs greatly in action. They have been brought into commercial use over the last 10 years or so as an answer to the arsenic-resistant tick. Chlorinated hydrocarbons play a major role in present-day cattle tick control. A knowledge of their limitations is necessary to ensure satisfaction in their use.

(3) Organic Phosphates.

This type has only been available commercially in the last year or two for cattle tick control. Malathion and diazinon belong to this category. Other organic phosphates, such as parathion, are available for agricultural use. Their use for tick control purposes is to be condemned.

RESISTANCE.

Cattle tick resistance to all available tickicides would appear to occur. Arsenical resistance has developed widely over the past 15 years. Similarly, resistance to chlorinated hydrocarbons has developed considerably since their inception some 10 years ago.

Chlorinated hydrocarbons show a good deal of cross resistance. Once a resistance to one develops, a resistance to the others is soon apparent. DDT seems to be the exception to the rule here, for it will continue to control ticks resistant to other chlorinated hydrocarbons.

Thus, for instance, if a resistance has developed to BHC, it would be unwise to use any of the other chlorinated hydrocarbons, excepting DDT, as a resistance to them could be expected also.

Fortunately, DDT resistance does not appear to be very widespread as yet.

The position in regard to resistance to organic phosphates is at present uncertain. Evidence gathered from farms and properties would suggest that a definite problem in this respect does exist. Organic phosphates will control chlorinated hydrocarbon-resistant ticks, however, and here they are particularly useful.

DIPPING OR SPRAYING?

Some of the chlorinated hydrocarbons and the organic phosphates have not been satisfactorily stabilized for use in a dipping vat. Thus some preparations are suitable for spraying only.

Dip Mixtures.

DDT, BHC, toxaphene, dieldrin and aldrin are marketed as dip mixtures.

DDT is available in several forms. The most suitable appears to be in the form of a 50 per cent. paste. Several such commercial lines are now available. Previously, hardness of water was considered a major problem with this tickicide, as hard waters precipitated the DDT, which fell to the bottom and could not be resuspended. Improved formulations which will mix with water up to the maximum degree of hardness likely to be found are now available. One

disadvantage of the paste-type preparation is that it requires preheating before mixing.

Other DDT preparations are in the form of wettable powders or emulsions. Neither tend to be as satisfactory as the paste-type, but can be used in any type of water.

BHC (gammexane) toxaphene, and aldrin possess minor individual advantages and disadvantages but their characteristics are essentially similar. They are mainly emulsions suitable for dipping or spraying, although one paste type is available. They all give a quick and complete kill of ticks and low to moderate residual effects. Unfortunately resistance is fairly widespread and there have been reports of poisoning of cattle on occasion.

Spraying Mixtures.

All the available tickicides can be used for spraying. Two types of spray dipping methods are in operation. One delivers a small volume of fluid under high pressure using a small jet. The other delivers a large volume of fluid under low pressure, using a patented type of fairly large aperture jet. In the latter there is much less likelihood of clogging of jets than in the former, particularly with DDT or BHC mixtures.

The organic phosphates at present are suitable for spraying only. They give a quick and complete kill of ticks in all stages and are extremely valuable where resistance to other insecticides has developed.

An important advantage of spraying over dipping is that the chemical can be continually changed and resistance is less likely to evolve. However, there

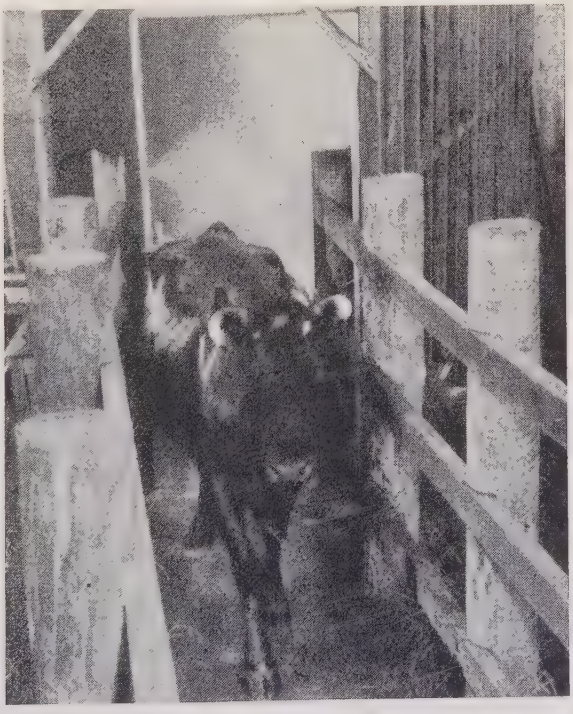


Plate I.

Spraying for Tick Control. Cow leaving modern spray race, showing good "wetting" obtained.

is likely to be some waste of fluid, as it is not wise to retain any run-off from one treatment for another.

Spraying gives quite satisfactory results for tick control purposes. However, it is not recognised as being efficient enough to ensure 100 per cent. results for tick eradication or cleansing treatments, particularly where large numbers are concerned. Thus a limitation is placed on the numbers of stock which may be sprayed for cleansing purposes. Depending on the circumstances, 10 head is usually the limit and any more than 10 head must be dipped.

Efficiency and Residual Effect.

The important consideration is, will the tickicide kill the cattle ticks at all stages of their parasitic life?

Biologically, DDT appears a very poor insecticide. However, results in practice are much better, and this tickicide is the one most widely used in place of arsenic. DDT does not give a sudden kill, but exerts its effects over several days. Some stages are likely to survive treatment, namely the fully engorged females and nymphs in the moult. Any fully engorged females which do survive are unlikely to lay many viable eggs. Many of the poor features of DDT are largely counteracted by its high residual effect in the hide.

Other chlorinated hydrocarbons give a good kill of nearly all stages of ticks. Their effect is more rapid than with DDT and results can be seen within a few hours of treatment. Diazinon gives an excellent and very rapid kill of all stages of cattle tick. The residual effect of BHC and other chlorinated hydrocarbons is less than DDT and that of diazinon is practically negligible.

TOXICITY.

Toxicity is an all-important consideration. DDT used on its own has never been known to cause the death of cattle. However, used in conjunction with arsenic, *which practice is not recommended,* death can occur. BHC has killed cattle, particularly those in poor condition in drought time. Toxaphene, dieldrin and aldrin have all been known to cause losses, particularly in young calves. No reasonable explanation can be given why toxicity occurs at some times and not at other times. Diazinon is reported to be quite safe for use.

Cattle affected by chlorinated hydrocarbon poisoning may show shivering or tremors. They may stagger or gallop about madly and bellow. Badly affected ones go down and show severe convulsions and finally die. Treatment is aimed at sedation of the beast by injection of barbiturates or chloral hydrate till the effects of the poisoning wear off, sometimes taking several days.

All concentrate preparations are dangerous to humans and must be handled with care. A note of warning is sounded. Always abide by the manufacturer's instructions in regard to mixing. If satisfactory control is not being obtained at the recommended strength, it is likely that resistance has developed. Do not increase the strength. Instead try a different type of preparation.

COST.

All the newer insecticides are more costly than arsenic. They must be handled efficiently and not wastefully to get maximum economy. Cost of newer insecticides should not be considered a limiting factor towards their greater use over arsenic. They have a greater efficiency, are less dangerous to use, and are a necessity if arsenic resistance develops.

Management is all-important in reducing cost, particularly with DDT mixtures. All owners of DDT dips would be well advised to take note of the recommendations given in the Department of Agriculture and Stock's advisory leaflet No. 147 entitled "Do You Dip Your Cattle with DDT?"

Leptospirosis in Cattle

By B. PARKINSON, Divisional Veterinary Officer, Maryborough.

No claims can yet be made on behalf of vaccination against leptospirosis in cattle in Queensland. However, in herds where leptospirosis produces annual losses through sickness of calves or adult cattle, or through abortions, yearly vaccination would appear to be well worthwhile.

Leptospirosis is an infectious disease capable of affecting man and all species of domestic animals. It is caused by a germ of the genus *Leptospira*, of which there are a large number of species. The common ones causing sickness in farm animals are *Leptospira pomona* and *Leptospira hyos*. In Queensland, outbreaks in animals are most commonly encountered in cattle and pigs, but elsewhere horses and sheep have been involved.

The disease has practically a world-wide distribution. It occurs in all States of Australia, and is widespread in all dairying areas of Queensland. Isolated outbreaks have occurred in some Queensland grazing areas.

Before 1949, leptospirosis in livestock was relatively unknown. Investigations in the Gympie district in 1949 by Departmental officers confirmed that leptospirosis was causing disease in cattle. Since the first inquiry, the number of positive diagnoses of the disease has increased yearly.

WHAT FORM DOES THE DISEASE TAKE?

The disease is quite widespread. It may produce rapidly fatal sickness in young calves. It may produce a less fatal sickness of adult cattle, or it may cause pregnant cows to abort their calves without other apparent symptoms. Variation in severity and course of the disease will occur in different outbreaks and even in the one herd.

In Calves.

The younger the calf, the more severe the disease seems to be. Older calves usually have a milder attack.

Sudden death (in 24 hours) of young calves may be the first noticeable sign that the animal had been sick. A typically affected calf will have no appetite, will lie around, and will tire and pant if driven. A fever (temperature of 105–107 deg. F.) is present. Examination of the membranes of the eye and mouth will show paleness and a yellowish tinge (anaemia and jaundice). Quite often the first indication of a sick calf will be the passing of "red water" (haemoglobinuria).

Death may ensue within 1–7 days of the first appearance of symptoms. Some calves may recover after sickness lasting many weeks, and many remain unthrifty for much longer periods.

In Adult Cattle.

A typically affected adult beast goes off its food, lies around with little desire to move, and may be stiff. Fever (temperature from 104–107 deg. F.) is common. Closer examination will show jaundice and anaemia. Some will also show red water. This is usually transient and may not be noticed. Death may ensue in several days. Usually the death rate is not high. More often the animal is sick for about 10–14 days, showing loss of weight. Recovery is prolonged over a period of weeks.

Milking cows affected show a sudden drop in production. This can occur over one milking. The milk may be changed in appearance—curdy, watery, or blood-stained. The udder may dry up or quarters become hard. Full production may not be regained for several weeks after recovery. In some cases, this form of mastitis may be the only noticeable symptom.

Pregnant cows showing acute symptoms often abort their calves.

AS A CAUSE OF ABORTION ONLY.

Leptospirosis, on evidence gathered on the farm, has been blamed for many severe abortion storms in dairy herds in various parts of the State. However, laboratory procedures have so far been unable to confirm or deny the farm evidence which is so strong that the disease must be considered a major cause of abortion. Such outbreaks of abortion have become very noticeable in the last few years.

Usually abortion occurs with no before or after warnings of sickness. An occasional cow may show some clinical symptoms of the disease. The loss of calf may occur at any stage of pregnancy. It is commonly about 5–7 months. Retention of the afterbirth has been observed in many cases following leptospiral abortion.

Cows that have aborted due to leptospirosis do not have any return-to-service problem. They should not abort due to leptospirosis again, as immunity appears to develop strongly.

If abortions are occurring in animals which have been vaccinated with Strain 19 against brucellosis, and no return-to-service problem is evident, then leptospirosis must be suspected very strongly to be the cause.

WHAT POST-MORTEM SHOWS.

An acute fatal case, on post mortem, will show paleness of tissues, thin watery blood, a yellow discoloration of fat and other tissues and red or brown urine. Kidneys may show small haemorrhages. The spleen and liver may be congested and swollen.

In chronic unthrifty cases which may be destroyed, the kidneys may show the only prominent abnormality, being swollen and scarred.

Can leptospirosis be confused with other diseases? Most certainly it can, particularly in adults. In adult cattle it may be often difficult to decide between a case of acute leptospirosis from one of tick fever. This problem seldom arises with younger animals, in which tick fever is very rare. The following points may help:

1. In adult cattle, a higher death rate is due to tick fever than to leptospirosis. The reverse applies to young cattle.

2. There is no response in a case of leptospirosis to the drugs commonly used for treating tick fever.

3. Milk secretion in cows is altered more in leptospirosis than tick fever.

4. Usually, but not always, if adults are affected with leptospirosis, calves are also. Thus if sickness is being experienced in adults and calves at the same time, leptospirosis is more likely to be the cause than is tick fever.

Some times it may be hard to "pick" leptospirosis from certain stages of other diseases, such as acute mastitis, ephemeral fever, salmonellosis or post parturient haemoglobinuria.

Again, if abortions only are occurring, other diseases such as brucellosis and vibriosis must be considered.

LABORATORY AIDS TO DIAGNOSIS.

If a correct range of specimens is sent in, the farm diagnosis can be confirmed by a laboratory.

Agglutination tests on blood serum are most commonly used. A reaction to the blood test may take up to several weeks to develop after initial infection. Once a reaction develops, it may persist indefinitely. Thus the inference of a positive reaction is that at some time in the past the beast has been infected with leptospirosis. If reactions to leptospirosis occur in a group of cows that have aborted, and other causes of such can be eliminated then it is generally assumed that leptospirosis is the cause of such trouble. Such a test readily confirms whether leptospirosis could be the possible cause of abortion. It is not a final proof that it is. This test also will detect recovered or carrier cases of the disease.

Examination of urine preserved with a few drops of formalin often will reveal the presence of the leptospira germs. Germs may be excreted in the urine for periods of up to three months in calves and three to four weeks in adult cattle, commencing several days after initial infection. Thus this test can often be used in cases of fairly recent infection. Urine should be submitted from recovered and in-contact animals as well as clinical cases.

Another test makes use of guinea-pig inoculation of blood from acute cases, or of tissues from fatal cases. Again the causative germ may sometimes be detected under the microscope in specially stained sections of kidney from fatal cases.

It will be seen that often it is difficult to pick leptospirosis on the farm. Your local Veterinary Surgeon or Stock Inspector is best suited to carry out investigation. He will be able to determine the specimens necessary to ensure a diagnosis of the condition being made.

CAN LEPTOSPIROSIS BE TREATED?

Leptospira germs are susceptible to many of the sulphonamide and antibiotic drugs. The condition can often be treated successfully.

Sulphadimidine, penicillin, streptomycin, aureomycin, terramycin and chloromycetin have all been used. The popular treatment, on a basis of efficiency and low cost, would appear to be streptomycin. It is important that animals be detected and treated in the early stage of disease.

Streptomycin is administered as an injection into the muscle of the rump (1 gramme for calves, 4 grammes for adults). Often one injection only is needed. It may be repeated in 24 or 48 hours if necessary.

WHERE GERMS COME FROM.

Leptospira germs are passed out in the urine of cows and calves for periods already stated. Urine of recovered and in-contact cattle can be the source of germs which may infect others. Pigs are also frequent carriers of leptospira. Other than abortion or stillbirths of piglets in pregnant sows, pigs rarely show evidence of leptospiral infection. However leptospiral infection may be associated with the cause of runts or weakling pigs. These should be treated with caution in relation to the spread of infection. Pig urine may be the source of infection.

To survive for any length of time, leptospira germs need moisture. They are very susceptible to drying, but under muddy conditions may survive for months.

HOW CATTLE BECOME INFECTED.

Cattle contract the disease when water or mud contaminated by urine of carrier animals comes into contact with their mouths or nostrils. Contamination of slight cuts or abrasions to the legs may also allow entry of the germs to the system. It is also possible that germs may gain entry through unbroken skin.

The habit of calves sucking each other tends towards greater spread. Urine contamination of the area being

sucked allows direct transfer of infection to mouths and nostrils of susceptible calves.

TO PREVENT LOSSES.

The following points to prevent spread are offered:—

1. Avoid wet or muddy conditions about yards, lanes, pastures or water troughs.

2. Keep pigs strictly separated from cattle.

3. If pigs must be bought, then secure them from farms where the cattle are known to be healthy; pigs or calves or cows bought in saleyards can introduce leptospirosis into a healthy herd.

4. When the disease appears in a herd, rear all calves born subsequently in strict isolation from the *whole* of the affected group (there are certain to be some carriers among the latter).

5. If the disease appears in calves, keep them strictly isolated from the adult herd.

VACCINATION.

Vaccines for leptospirosis have been used with apparent success overseas for some time. The vaccine has been available in New Zealand, and some farm trials have been undertaken in Queensland. Results of vaccination have proved inconclusive as we have no evidence that natural infection has yet been introduced into the vaccinated and unvaccinated herds.

The vaccine is a killed culture of the germ. It is not able to introduce infection into a previously clean herd. Such a vaccine is now being manufactured in Australia and is available for use. A dose of 5 c.c. injected under the skin of an adult beast gives immunity for at least 6 months and possibly 12 months. If calves are vaccinated under three months of age it is wise to repeat about three to four months of age.

Efficiency of vaccination is not claimed at present. However in herds where leptospirosis produces annual losses either through sickness of calves, or adult cattle, or abortions, yearly vaccination would appear to be well worthwhile.

WARNING.

As mentioned previously, leptospirosis is transmissible to man. Many cases of human leptospirosis have occurred amongst dairy farmers in association with infection of the cattle on the property. Thus full care and preventative measures should be adopted in handling all cases of leptospirosis. This is equally important to prevent spread of infection amongst the stock as well as preventing infection of the farmer and his family.

It would be unwise for dairy farmers to wade in bare feet in urine-contaminated muddy yards under wet conditions. Rubber boots should always be worn under these conditions. Humans may be infected through contamination of cuts or abrasions of the feet and legs just as easily as cattle. The handling of cows' tails at milking time could also be dangerous, as the urine of carrier cows could contaminate the brush. The common organism causing bovine leptospirosis in Australia, while perhaps not fatal to man, may cause severe sickness.

Chlorine for Udder Washing

Every udder wash solution should contain some sterilizing compound. A concentration of 400-800 parts per million of available chlorine has been found satisfactory ($1\frac{1}{2}$-3 teaspoons of 5 per cent. chlorine solution per quart of tank water).

More Beef From Brahman Cross

By J. ARBUCKLE, Senior Adviser in Cattle Husbandry.

In a cattle weighing trial in coastal Central Queensland over a period of 2½ years, Brahman cross-bred steers grew at an average rate of 13½ oz. a day, as against 10⅘ oz. for Herefords, and during that time gained 795 lb. compared with 636 lb. for the Herefords.

The dressed carcasses of the cross-breds were 92 lb. heavier and of better quality.

Reports from the Burnett Valley and far north Queensland show that steers of part Brahman breed grow faster than British breed steers. This article records a similar trial on coastal country of central Queensland.

The trial was conducted on "Bellbroughton", the property of Mr. James Angel. A weighbridge was installed in October, 1953. The object was firstly to find out exactly when, and how fast, stock made weight gains and also the time of the year when they ceased to gain weight. To do this, regular weighings were made. At the same time, a comparison was made between cross-bred Brahman and Hereford steers.

LOCATION OF TRIAL.

"Bellbroughton" is about 50 miles north of Rockhampton and 30 miles from the coast.

Two soil types are common. Both are clay loams. One is a heavy dark grey. The second is of a greyish brown colour and is low in available phosphate.

No grasses have been sown in the paddocks containing the trial cattle. The naturally-occurring grasses consist of a number of species of blue grasses (*Dicanthium* and *Bothriochloa*) and bunch or black spear (*Heteropogon contortus*).

The average carrying capacity of store steers is rated at about one beast to six acres.

The yearly average rainfall is 35 inches. Summer temperatures occasionally are as high as 100 deg. F. For the six months from October to March the average maximum temperatures are 85 deg. or over at Rockhampton. December recordings show an average maximum of 89·6 deg.

Frosts are common during July but the average minimum temperature does not fall below 50 deg.

CONDITIONS DURING TRIAL.

Seasonal conditions were better than average during the term of the trial. Two inches of rain were recorded in October, 1953. Further falls of 216 points and 276 points in November and December respectively ensured quite fair grazing. The trial cattle were weaned in those circumstances and made weight gains from the beginning of weighing. The first weights were recorded on November 12, 1953.

Plate 1.

Cross-bred Steers, ¼ Zebu-¾ Hereford, Rising Three Years, Average Weight 1,037 lb.

Rainfall for 1954 was 10 in. above average. In July, 340 points were recorded and that fall was responsible for a good growth of grass in spring. The rain had come at a most opportune time as the cattle had started to lose weight.

Again in 1955 the rainfall of 4,681 points was well above average; 600 points were recorded in May ensuring enough soil moisture for pasture growth over the winter and early spring months. However hot, drying weather prevailed in late spring and early summer. Pastures dried off and weight losses were recorded.

The run of wet years continued into 1956 and over 40 in. of rain were recorded to the end of May. That was an excessively wet season and the soil became rather waterlogged. As a result pasture growth was not so productive as usual.

DESCRIPTION OF CATTLE.

The dams of the trial steers were well-bred Hereford cows which for generations had been selected for type and quality.

Half-bred bulls of Brahman-Hereford breeding sired the cross-bred steers which were thus ¼ Brahman and ¾ Hereford.

The Hereford steers were sired by stud bulls and were high class steers of their type.

The Hereford bulls were put with the herd two months before the cross-bred bulls. As a result the Hereford steers were generally two months older than their cross-bred mates. Further, only a limited number of cross-breds were available for use in the weighing trial. Altogether 13 cross-bred steers were used, and their weights were compared with those obtained from 19 Herefords.

It will be noted that the Herefords had an age advantage at weaning on November 12, 1953. At that date the average age of the Herefords was 11-12 months compared with 9-10 months for the cross-breds.

Weaning weight of the cross-breds was 479 lb. and the Herefords were selected to give a roughly comparable weight of 488 lb.

MANAGEMENT.

The trial steers at all times were run together as one mob and were managed in the same way.

After weaning they were held for three weeks on a couch grass flat with other similar cattle. That was a "settling down" period after which they were grazed in a 5,000-acre paddock with from 600 to 1,000 head of other male cattle.

In October, 1954, the trial group was moved to a paddock of 600 acres where it was part of a total mob of 100-120 head. The group remained in that paddock for the duration of the trial.

The dipping programme for cattle tick and buffalo fly control followed the normal routine for the property. Dipping was done at roughly monthly intervals. To minimise working of the cattle, weighing was carried out when the stock were mustered for dipping.

Drinking water and shade were readily available throughout the term of the trial.

RESULTS OF WEIGHINGS.

A study of the growth rate shows that comparatively rapid gains were made during December, 1953, January and February, 1954. Winter losses up to 69 lb. then occurred, followed by heavy gains in November-December, 1954, and again in April and May, 1955. Mid-winter of 1954 saw weights practically at a standstill. Owing to dry conditions, weight losses occurred in November and December, 1955. Highest weight gains of the whole trial then followed in January, 1956, when the Herefords reached a weight gain increase of 2·53 lb. a day for one weighing period.

It is obvious that stock gain most weight in January to May inclusive. Weight losses occurred during June and July of one year and November and December the following year. It is thus indicated that weight losses are likely to occur at any time from June to December, depending on available pasture.

With reference to the two groups of steers the Herefords gained 636 lb. and the cross-breds 793 lb. in 941 days from weaning to slaughter. On a daily basis this is 10⅘ oz. for the Herefords and 13½ oz. for the cross-bred group.

The distribution of the 157 lb. difference in liveweight gain in favour of the cross-breds was—

	lb.
(1) Weaning to May, 1954 (4 months)	59
(2) May, 1954 to May, 1955 (12 months)	64
(3) May, 1955 to June, 1956 (13 months)	34

Plate 2.

Pure-bred Hereford Steers Aged About Three Years, Weighing 831 lb. on the Average.

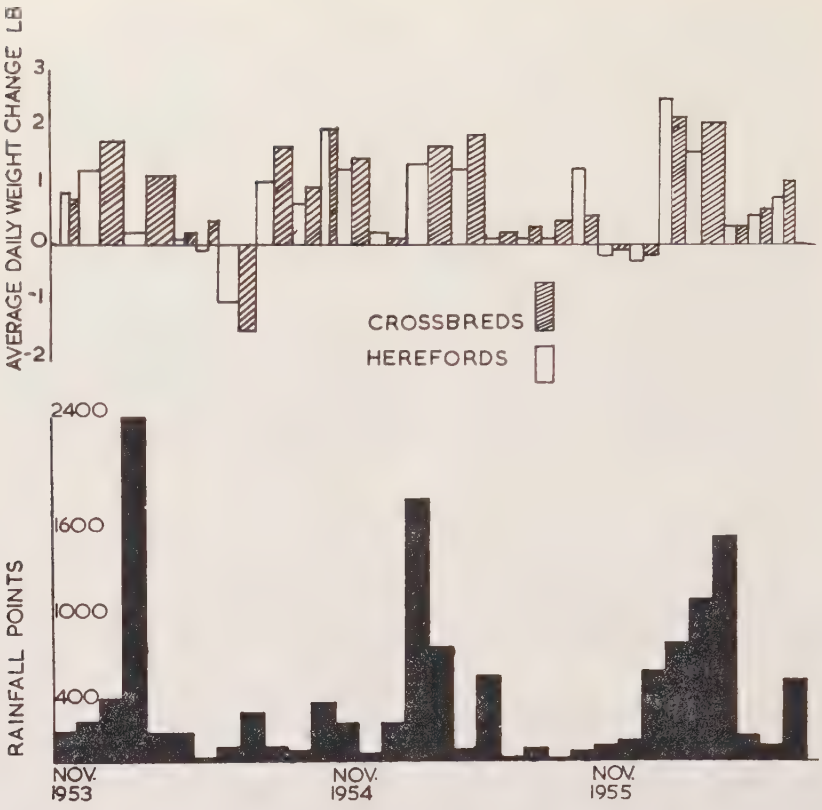


Plate 3.

Growth Rate of Steers in Relation to Rainfall.

This indicates that the cross-breds develop and grow faster at an earlier age than Herefords under the conditions described.

CARCASS WEIGHTS AND APPRAISAL.

The following table summarises the results at slaughter:

	Cross-bred Group.	Hereford Group.
Last Station liveweight 11–6–56	1,272 lb.	1,124 lb.
Weight range	1,062–1,452 lb.	947–1,316 lb.
Dressed carcass weight 18–6–56	673 lb.	581 lb.
Dressing Percentage	52·9%	51·6%
Grade—First	79%	26%
Second	15%	55%
Unsuitable for Export	6%	19%

Four cross-bred carcasses and one Hereford carcass were down-graded owing to being overweight.

At the time of slaughter some of the Herefords were obviously not "finished" but it was decided to slaughter all animals then rather than hold them for another year. Lack of finish was mainly responsible for the down-grading of the Herefords.

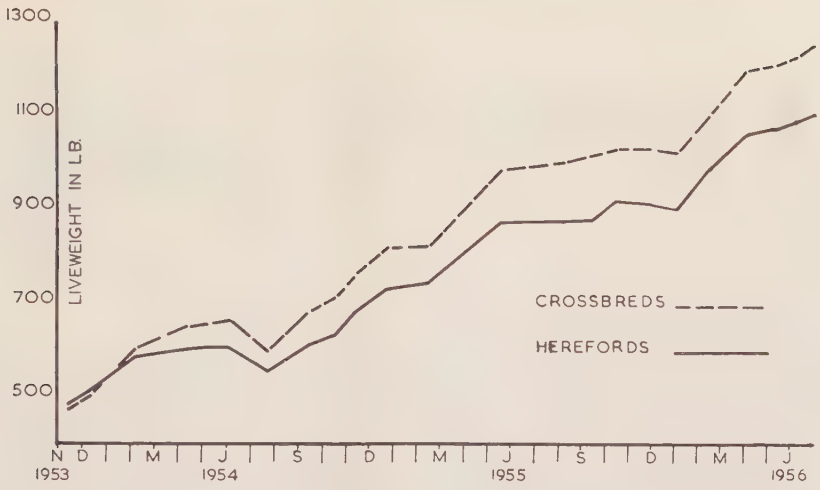


Plate 4.

Comparative Growth Rate of Steers.

In addition to producing an extra 92 lb. of beef per head the cross-breds were superior in grading results and dressing percentage.

Acknowledgement.

The valuable co-operation of Mr. J. Angel and his staff is gratefully acknowledged.

Poison !

The lead in the objects you see can cause sudden death to animals. Bury them or remove to a safe place.

A LETTER TO

Dear Dad, Thank you for your letters. We found the sheep very difficult to muster for the first day of shearing here, and by the time we got them to the yards the inside of the woolshed was almost dark. So we had a lot of trouble trying to get the sheep in the shed pens for next day's shearing. They were very troublesome and stubborn, and even though we carried a few up the ramp and put them in the nearest pen as decoys, the ones in the yard couldn't see them in the dim light. By that time things were in a bit of a flap, dogs barking and men swearing, and the tea-bell had gone. The boss must have heard all the commotion because he came down and brought a hurricane lamp with him, lighted it and hung it about 5 ft. up on the far wall. The sheep gave no trouble then, and walked towards the light. I must tell you about one of the station hands who lost a dog from strychnine poisoning. When a Vet came to dinner at the station a few days later I had an opportunity to get some advice on this. He said that strychnine poisoning is difficult to treat with home remedies and that a Vet should be called if at all possible. However, he did give me some useful tips and so I am passing on a few of them. The amount of strychnine likely to cause death in a dog is very very small; about the size of a pin-head. This is interesting when you think of the amounts some sheepmen scatter around when they are poisoning carcasses for bait. In treating strychnine poisoning you have to be quick to be successful. If you can get the dog to vomit early you may save it. This is the limited time in which first aid can be of use. After strychnine has left the stomach and been absorbed by the small gut, getting the dog to vomit is valueless. Best home remedies for making the dog vomit are salt or bluestone. You dissolve 1–2 teaspoons of salt in warm water and drench the dog. Or you can try tossing a teaspoon of salt towards the back of the mouth. If you try and drench the dog whilst he is having a fit he may get fluid in his lungs. If using bluestone, dissolve in four tablespoonfuls of water almost as much bluestone as covers a sixpence. Vomiting should come within ten minutes and is likely to be repeated several times, maybe three to six. Put the dog in a dark room or shed away from all movement or noise, and wait for the Vet to come. We could do with some rain here, and the 'roos are bad. I expect to be doing a bit of shooting in the week-end.

Affectionately, Bill.

Bluecomb Strikes Pullets in Lay

By P. D. RANBY, Veterinary Officer.

Trials with Furazolidone in the Brisbane area have given promising results in outbreaks of the liver form of bluecomb.

Bluecomb, known also as "pullet disease," avian monocytosis and uraemia in fowls, and as "mud-fever" in turkeys, is a disease which, although not of great importance to the poultry industry as a whole, may cause severe losses on individual farms.

It usually strikes at a critical time, just when pullets are coming into full lay and starting to give some return to the farmer.

The main loss is through deaths, but lowered egg production occurs.

On affected farms the death rate has been variable from year to year. For example, on one farm deaths in pullets in 1952 were 18 per cent.; in 1953, 2.5 per cent.; in 1954, 19 per cent.; and in 1955, 1.5 per cent.

CAUSE NOT KNOWN.

The cause of bluecomb is not known, but the manner in which the disease spreads and the fact that it responds to certain treatments suggest that it is infectious.

Overseas, bluecomb has been commonly associated with the feeding of new season's wheat, but such an association has not been observed in Queensland.

Typically, bluecomb in fowls occurs in the early period of lay, hence the alternate name, pullet disease. A peculiarity of the disease is that it is uncommon in older fowls. When it does occur in such birds, it affects only an odd one from time to time, never becoming epidemic.

Observations on farms in the Brisbane area strongly suggest that the better layers in a flock are more likely to contract the disease. This fits in with one theory that high egg production brings about a situation in which demand by pullets for some essential nutrient outstrips the supply. It seems just as likely, however, that egg production acts as a "trigger" mechanism, setting a virus into action.

SYMPTOMS IN A FLOCK.

If laying pullets are found dead in good condition under the perch in the morning, bluecomb may be suspected.

Outbreaks occur usually two to three months after pullets have started to lay. On account of this, bluecomb can have serious economic effects.

The flock as a whole may seem a little dull but few if any fowls appear really sick. Yet dead pullets may be found each morning.

Severely ill cases, if seen, are sometimes noticed first thing in the morning. They may be affected by prostration and fever and sometimes a whitish or pale yellow diarrhoea.

Usually a proportion of fairly bright fowls in the flock are affected by this diarrhoea but it may be overlooked in white plumaged birds. The diarrhoeic material consists largely of urates derived from the kidneys.

Some bluecomb cases have body temperatures up to 113 deg. F. (normal 107 deg. F.). Such severely fevered cases can sometimes recover rapidly, the temperature falling to normal in about 12 hours.

The proportion of dark-blue or black coloured combs in an outbreak is very variable, being from nil to 95

per cent. of the flock. Usually, however, only odd ones are seen among live birds that are not fevered and prostrate. Fowls in the latter class nearly always show the bluish comb.

The fall in egg production that occurs is also variable. It may be as much as two-thirds. The fall may occur as many as 10 days before the appearance of definite cases of the disease. On the other hand, there may be no time lag.

When obvious cases start appearing, feed consumption may fall to some extent.

Bluecomb-affected fowls show certain significant changes in the white cells of their blood stream. It is from these changes that the alternative name of avian monocytosis derives.

COURSE OF THE DISEASE.

The course of a bluecomb outbreak in a flock of the one age group is usually only two to three weeks. Odd cases may, however, continue to occur for some little time after a severe outbreak.

Death rate may be up to 15 per cent. in Queensland but more often is about 5 per cent. Deaths, and obviously sick birds that recover, may together amount to as much as 20 per cent. of the flock, but this would be an unusually severe outbreak. In some other countries a large proportion of the flock is commonly affected but few deaths occur. This type of outbreak is uncommon in Queensland.

POST-MORTEM FINDINGS.

Fowls that have died of bluecomb are almost always in good condition. The skin veins over the breast are often congested and prominent and the underlying flesh somewhat darkened. On the other hand, the breast muscle may be very pale and resemble fish flesh. This may be general throughout the muscle or only in bands. It is the result of degeneration of muscle fibres.

The blood vessels of the small intestine and wind-pipe often appear fiery (inflamed). These changes are probably caused by the general feverish condition.

The ovary is active and numerous ova (eggs) present in various stages of formation are indicative of good egg production. The ova may or may not show signs of degeneration such as flabbiness and change in colour. Sometimes they degenerate to the extent that they break and release their contents into the abdominal cavity.

In addition we find:

(*a*) *Liver form*: (see Plate 1.). Numerous small pale necrotic foci (areas of dead tissue) up to a pin head in size on the liver surface and throughout its substance. Small haemorrhages on the heart. Kidneys slightly pale and swollen. This is the more common form in Queensland.

(*b*) *Kidney form*: Liver normal. Kidneys much swollen throughout, often being two or three times the normal size. Frosting of the kidney by white needle-shaped urate crystals is usual in this form.

Occasionally the white urate deposits are more generalised (visceral gout) and may be found on the heart sac and on the surface of the various abdominal organs. In some cases the ureters (tubes carrying away the waste materials from the kidney) are distended by accumulations of white urate material.

Although these two main forms of the disease are usually seen separately there are occasions on which both occur in the one outbreak.

WHAT TO LOOK FOR.

As a method for the recovery of the infectious agent has not yet been found, diagnosis has to be based mainly on findings on the farm.

These may be summarized as follows:

1. A few pullets or cockerels affected each morning for as long as two or three weeks.

2. Affected fowls dying in good condition, often with a full crop.

3. Ovary active, indicative of good egg production.

4. High fever and the presence of a whitish or pale yellow diarrhoea.

5. Post-mortem lesions—typical of either the liver or kidney form of the disease.

Laboratory procedures can be used to determine whether changes are present in the white cells of the blood and thus help to confirm the diagnosis.

WATCH THESE DIFFERENCES.

The liver form of bluecomb must be differentiated from visceral leucosis affecting the liver. In that disease the liver lesions are not clearly demarcated from normal tissue, are irregular in shape and greater in size. Also, enlargement of the liver as a whole occurs and wasting of the carcass is present.

The kidney form of bluecomb must be differentiated from:

1. *Visceral leucosis* affecting the kidney. In that disease there is usually only one kidney affected and

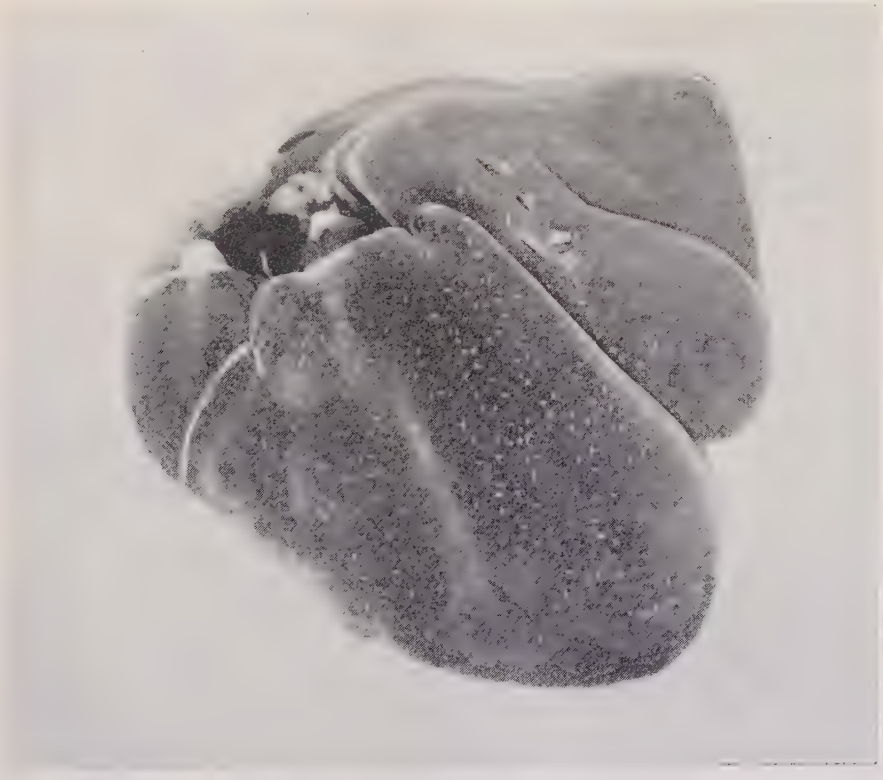


Plate 1.

Liver from a Pullet that Died from the Liver Form of Bluecomb. Note the small pale areas of dead tissue (necrotic foci) up to a pinhead in size.

the swelling is irregular. Wasting of the carcass and an inactive ovary are present. Only odd birds are affected.

2. *Vitamin A deficiency*—both kidneys are affected as in bluecomb but other lesions of vitamin A deficiency such as swollen watery eyes and throat pustules are present. Affected birds are unthrifty and the ovary is inactive. There is an absence or scarcitiy of green feed and no (or insufficient) vitamin A supplement is provided.

3. *Chick nephritis*—kidney lesions are similar but a younger age group is affected than is the case with bluecomb.

TREATMENT OF BLUECOMB.

Antibiotics.

Results given by members of the tetracycline group (such as "Aureomycin" and "Terramycin") are somewhat variable being quite good in some outbreaks but disappointing in others. These antibiotics are preferably supplied in the drinking water at a concentration of 0.5 per cent. to 1.0 per cent. active antibiotic for four days or slightly longer.

Furazolidone.

Preliminary farm trials with Furazolidone carried out in the Brisbane area have given promising results in outbreaks of the liver form of the disease. It was used at a level of 0.02 per cent. in the mash for 10 days and appeared to abruptly halt deaths while 3 per cent. to 6 per cent. deaths occurred in similar but untreated affected flocks. In one trial, a recurrence of bluecomb cases occurred in a treated group 30 days after the commencement of treatment but the disease was then much less severe and of shorter duration than in the untreated group.

Egg production was recorded in two trials and the treated groups layed 21 per cent. to 23 per cent. more eggs than untreated groups over a period of approximately one month.

Molasses.

In the past, molasses in the drinking water or both drinking water and mash has been frequently used as a treatment.

In severe outbreaks in the Brisbane area of recent years, molasses when used at the rate of 4 per cent. in the drinking water for one week or more did not seem to be of any value.

Potassium Salts.

Potassium chloride or potassium dichromate at the rate of 0.5 per cent. in the drinking water (that is ¾ oz. per gallon) for five to seven days has also been used in the past. Their efficacy, like that of molasses, is doubtful.

Epsom Salts.

Epsom Salts, used at the rate of 1 per cent. in the drinking water (1½ oz. per gallon) for three or four days, is unlikely to be of any direct value.

In the present state of our knowledge furazolidone treatment for 7–10 days in the mash is probably to be preferred to the others mentioned but intelligent antibiotic treatment may be well worthwhile.

In addition to any medicinal measures taken, fresh litter should be placed in the affected pens if practicable.

☆ ☆ ☆

● *Planning a Farm Dam or Irrigation Scheme?*
Seek the Proper Advice.

☆ ☆ ☆

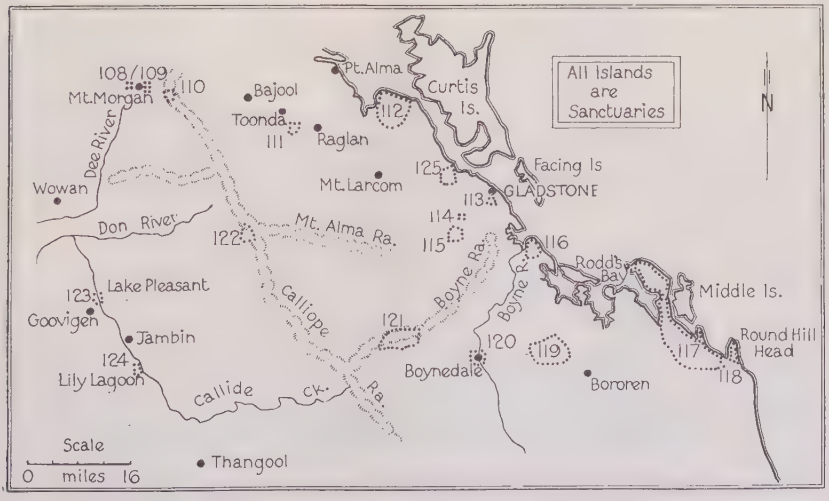
Queensland Fauna Sanctuaries

By C. ROFF, Fauna Officer.

(Continued from May, 1958.)

The following is an index of the sanctuaries outlined in Map 14.

Index No.	Sanctuary.	Area in Acres.
108	The bed of the Dee River and its banks, Mount Morgan ..	120
109	Water Reserve 38, Mount Morgan	830
110	St. Mary's Falls, Reserve 462, via Mount Morgan	500
111	State Forest Reserve 99, parish of San Jose, via Raglan ..	1,600
112	State Forest Reserve 60, parish of Rundle, via Raglan ..	16,000
113	Waterworks Reserve, Gladstone	124
114	Calliope River Water Reserve, adjoining the Calliope River School Reserve	19
115	State Forest Reserves 150 and 284, parishes Auckland and East Stowe, via Beecher	2,990
116	Properties of E., E.P., G.S. and D. C. Cloyner, Benaraby ..	3,620
117	Eurimbula Holding, Eurimbula	55,680
	State Forest Reserve 86, parish Eurimbula	900
118	Round Hill Reserve for Recreation and Captain Cook Memorial, via Bororen	1,000
119	Properties in the parishes of O'Connell, Rodd's Bay and Polmaily, via Bororen	15,240
120	"Glengarry," Boynedale	2,140
	Property of H. W. Bond and adjoining Camping and Water Reserve	1,664
121	State Forest Reserve 53, parishes Diglum, Booroom and Barmundoo, via Barmundoo	14,000
122	State Forest Reserve 218, parish of Manton, via Lancefield	3,735
123	Lake Pleasant, Goovigen	175
124	Lily Lagoon and area in portion 109 and Reserve 143, via Jambin	236
125	State Forest Reserve 137, parish Targinie	1,725

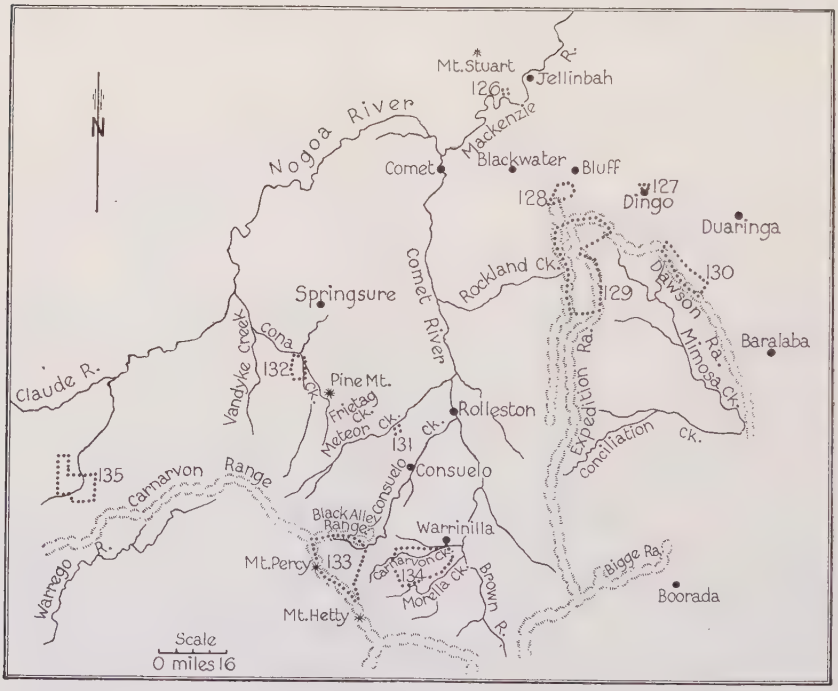


Map 14.

Map Showing Sanctuaries in Part of Fauna District No. 2. The sanctuary boundaries (as at December 31, 1957) are delineated by dotted lines.

The following is an index of the sanctuaries outlined in Map 15.

Index No.	Sanctuary.	Area in Acres.
126	Part of Coorooorah Station, via Emerald	320
127	Special Lease occupied by L. P. Landsberg, Dingo ..	1,280
128	State Forest Reserve 77, parish of Columba, via Bluff ..	9,600
129	State Forest Reserves 5 and 6, parishes Mimosa and Shotover, via Bluff	116,040
130	State Forest Reserve 54, parish Coomooboolaroo, via Duaringa	25,665
131	Springwood Lake, on Springbrook Grazing Farm, via Springsure	200
132	Nalcoombie Grazing Homestead, via Springsure	9,366
133	National Park Reserve 6, parish of Aubrey, Carnarvon Range and Gorge, via Injune	66,480
134	Haystack Swamp, Rewan Holding, via Rolleston	
	Rewan Stud Farm, via Rolleston	78,000
135	National Park Reserve 2, parishes Cungelella and Pluto ..	48,320



Map 15.

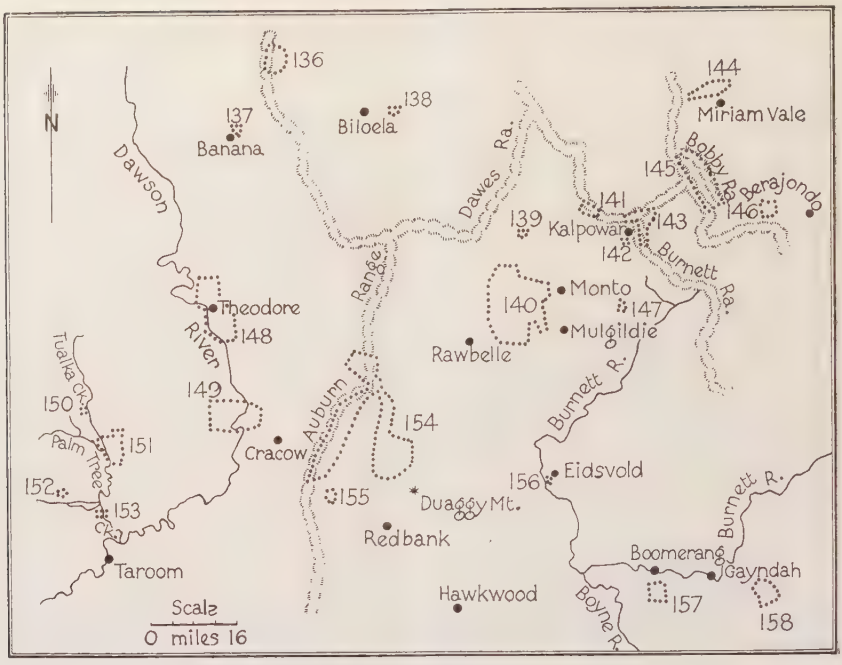
Map Showing Sanctuaries in Part of Fauna District No. 2. The sanctuary boundaries (as at December 31, 1957) are delineated by dotted lines.

The following is an index of the sanctuaries outlined in Map 16.

Index No.	Sanctuary.	Area in Acres.
136	State Forest Reserve 54, parish of Greycliffe, via Callide ..	14,720
137	Town Reserve and Water Reserve, Banana	640
138	Property of F. Hungerford, Biloela	1,031
139	Reserve for Scenic Purposes, Cania Gorge	880
140	State Forest Reserves 28, 160, 186, parishes Coominglah, Bailey, Clonmel, Coppin, Seleme and Bingmann	96,237
141	State Forest Reserves 24, 55, 123, parishes Monal, Dawes, New Cannindah	4,607
142	State Forest Reserve 193, parish New Cannindah	97
143	State Forest Reserves 95, 144, 179, 189, parishes New Cannindah and Minerva	10,355
144	" Bobiberum," Miriam Vale	4,940
	" Wadleigh," Miriam Vale	6,781
145	State Forest Reserve 67, parishes Bulburin and Thornhill ..	37,375
146	" Thornhill " via Lowmead	10,120
	State Forest Reserve 232, parish Warro	6,054
147	State Forest Reserve 215, parish of Cannindah, via Monto	1,893
148	Shire of Theodore	41,675
149	" Dawson Park," Cracow	12,417
	" Currawong " and " Gyranda," Cracow	27,660
150	Tualka Creek Water Reserve, Taroom	142
151	" Huntington," Taroom	8,057
	" Waterton," Taroom	6,043
152	Lake Murphy, Taroom	1,126
153	Lotus Waterhole and one mile depth surrounding lagoon, Taroom	2,012
154	State Forest Reserves 39, 64, 168, parishes Calrossie, Borania, Cloncose and Trevethan	95,875
155	" Rockybar," via Hawkwood	1,551
156	Camping and Water Reserve and portion of Burnett River, via Eidsvold	250
157	" Madoora," Gayndah	4,336
	State Forest Reserve 95, parish Malmaison	2,500
158	Brian Pastures, Gayndah	5,300

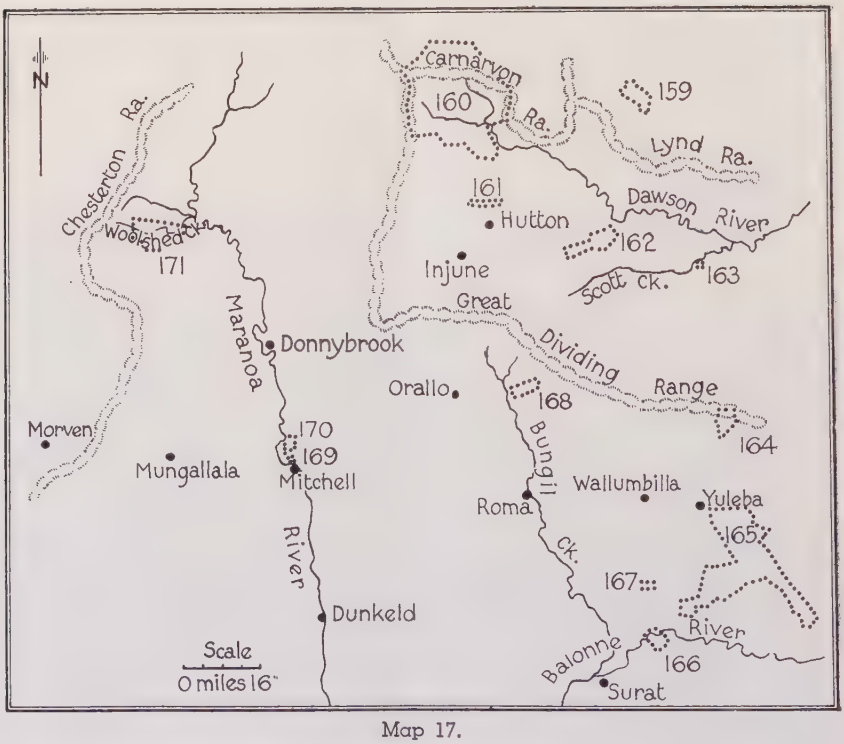
The following is an index of the sanctuaries outlined in Map 17.

Index No.	Sanctuary.	Area in Acres.
159	National Park Reserve 3, parish Cannon, Robinson Gorge..	11,400
160	" Westgrove " and " Warranilla," Injune	202,240
161	State Forest Reserve 10, parish Forrest, Injune	8,695
162	State Forest Reserves 20 and 55, parishes of Mount Hutton, Hallett and Stephenton, Injune	39,000
163	" Hornet Bank," Scott Creek, via Roma	50
164	State Forest Reserve 368, parish Combabula, via Yuleba ..	9,387
165	State Forest Reserves 60, 61, 78, 328, 385, 58, parishes Amoolee, Yuleba, Tinowon, Inglebogie, Gideon, Tchanning, Moraby, Callitris, via Yuleba	140,250
166	" Rockdale," Surat	5,735
167	State Forest Reserve 381, parish Tinowon, via Surat ..	2,465
168	State Forest Reserve 389, parish Gubberamunda, via Roma	5,065
169	State Forest Reserve 127, parish Barabanbel, via Mitchell ..	710
170	State Forest Reserves 126 and 135, parish Barabanbel, via Mitchell	3,705
171	State Forest Reserve 10, parishes Hillside and Sunnyside, via Mitchell	36,000



Map 16.

Map Showing Sanctuaries in Parts of Fauna Districts No. 1 and 2. The sanctuary boundaries (as at December 31, 1957) are delineated by dotted lines.



Map 17.

Map Showing Sanctuaries in Parts of Fauna Districts No. 1 and 4. The sanctuary boundaries (as at December 31, 1957) are delineated by dotted lines.

Plate 7.

Permanent Waterhole in Barambah Creek, Part of Brian Pastures Sanctuary, Gayndah.

Fruit and Vegetables

Wind damage in tomatoes is often serious during the winter and spring as the plants are not deep-rooted and the stems are extremely brittle. A sheltered position or interplanting with windbreaks will protect the plants. In ground crops, hilling, centre pruning and pinning down the laterals are useful in reducing losses.

Hilling is done by throwing up soil on each side of the young plants. Additional new roots grow in this soil and improve the plants' anchorage. In the more erect varieties, removal of some of the inner laterals induces a spreading habit of growth and facilitates pinning. This is done by throwing some soil into the base of the plant once the laterals have spread sufficiently. The soil forces the laterals gently down and holds them in position.

—R. L. PREST,
Senior Adviser in Horticulture.

Spacing of Citrus.

In the first 10 years of the life of a citrus orchard, production may be doubled by closer planting. However, irrigation is necessary. High production early in the life of an orchard is usually preferred to lower production over a longer period. Trees should, of course, be spaced widely enough to avoid over-crowding and to permit the use of mechanical equipment for spraying and cultural operations.

Unless large equipment is to be used, a 20 ft. by 20 ft. spacing is adequate Where the bigger, modern machines are used, a 24 ft. by 17 ft. spacing is suitable. Both give 108 trees to the acre, compared with 50 in 30 ft. by 30 ft. spacing. The closer spacing doesn't usually cause over-crowding, and the trees are kept to a manageable size.

—A. J. CROCKER,
Adviser in Horticulture.

Brucellosis-Tested Swine Herds

(As at 20th June, 1958.)

Berkshire.

A. P. and N. Beatty, "Deepdene," Barambah road, Nanango
S. Cochrane, "Stanroy" Stud, Felton
J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
G. C. Traves, "Wynwood" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Beau View" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
R. H. Crawley, "Rockthorpe" Stud, *via* Pittsworth
F. R. J. Cook, Middle Creek, Pomona
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark, "Florida," Kalbar
J. H. N. Stoodley, "Stoodville," Ormiston
H.M. State Farm, Numinbah
G. L. Gabanko and R. H. Atkins, "Diamond Valley" Stud, Mooloolah
L. Puschmann, "Tayfeld" Stud, Taylor
C. E. Edwards, "Spring Valley" Stud, Kingaroy
V. F. Weier, "Sa Crescent," Clifton
N. Rosenberger, "Nevrose," Wyreema
B. Osborne and Dr. J. W. Best, Miltown Stud Piggery, Warwick
W. Young, Kybong, via Gympie
E. J. Clarke, Mt. Alford, *via* Boonah
G. McLennan, "Murcott" Stud, Willowvale
C. F. W. and B. A. Shellback, "Redvilla" Stud, Kingaroy
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
A. C. Fletcher, "Myola" Stud, Jimbour
Q.A.H.S. and College, Lawes
E. F. Smythe, "Grandmere" Stud, Manyung, Murgon
E. R. Kimber, Block 11, Mundubbera
A. J. Potter, "Woodlands," Inglewood
Regional Experiment Station, Hermitage
J. W. Bukowski, "Secreto" Stud, Oxley
R. Astbury, "Rangvilla," Pechey
L. Pick, Mulgildie
D. G. Grayson, Killarney
A. French, "Wilson Park," Pittsworth
D. Ludwig, Cainable, via Beaudesert
J. & S. Kahler, East Nanango

Large White.

H. J. Franke and Sons, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, "Highfields," Murgon
R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen, "Bremerside" Stud, Rosevale, *via* Rosewood.
E. J. Bell, "Dorne" Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood.
H. R. Gibson, "Thistleton" Stud, Maleny
H.M. State Farm, Numinbah
V. P. McGoldrick, "Fairymeadow" Stud, Cooroy
S. T. Fowler, "Kenstan" Stud, Pittsworth
W. Zahnow, Rosevale, *via* Rosewood
Regional Experiment Station, Biloela
G. J. Hutton, "Grajea" Stud, Cabarlah
H. L. Larsen, "Oakway," Kingaroy
A. Palmer, "Remlap," Greenmount
G. I. Skyring, "Bellwood" Stud, *via* Pomona
G. Pampling, Watch Box road, Goomeri
M. Hall, "Milena" Stud, D'Aguilar
K. B. Jones, "Cefn" Stud, Pilton road, Clifton
Barron Bros., "Chiltern Hill," Cooyar
K. F. Stumer, French's Creek, Boonah
Q.A.H.S. and College, Lawes
R. S. Powell, "Kybong" Stud, Kybong, *via* Gympie
C. Wharton, "Central Burnett" Stud, Gayndah
S. Jensen, Rosevale, *via* Rosewood
V. V. Radel, Coalstoun Lakes
H. R. Stanton, Tansey, *via* Goomeri
L. Stewart, Mulgowie, *via* Laidley
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
O. J. Horton, "Manneum Brae" Stud, Manneum, Kingaroy
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes, Brisbane
R. Kennard, Collar Stud, Warwick
A. C. H. Gibbons, Mt. Glorious
A. Kanowski, "Exton," Pechey
L. C. and E. Wieland, Lower Cressbrook
P. L. and M. T. D. Hansen, "Regal" Stud, Oaklands, Rangeville, Toowoomba.
P. F. Ives, Capalaba
D. Ludwig, Cainable, via Beaudesert
J. C. Lees, "Bridge View" Stud, Yandina
R. Rhodie, Clifton
C. Assenbruck, Mundubbera
A. J. Mack, Mundubbera

Tamworth.

D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud, Riverview
Department of Agriculture and Stock, Regional Experiment Station, Kairi
F. N. Hales, Kerry road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
A. Herbst, "Hillbanside" Stud, Bahr Scrub, *via* Beenleigh
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
H. J. Armstrong, "Alhambra," Crownthorpe, Murgon
R. H. Coller, Tallegalla, *via* Rosewood
D. V. and P. V. Campbell, "Lawn Hill," Lamington
S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp
L. C. and E. Wieland, Lower Cressbrook

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
C. R. Smith, "Belton Park" Stud, Nara
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
"Wattledale" Stud, 492 Beenleigh road, Sunnybank
Kruger and Sons, "Greyhurst," Goombungee
A. Scott, "Wanstead" Stud, Grantham
G. C. Burnett, "Rathburnie," Linville
R. A. Collings, "Rutholme" Stud, Waterford
A. J. Mack, Mundubbera

British Black.

E. Pointon, Goomburra

Parallel Wire Trellis For Tomatoes

By C. N. MORGAN, Senior Adviser in Horticulture.

The parallel wire trellis is recommended for all tomato crops grown in the Redlands and adjacent districts. Here's how you may go about erecting and using it.

In 1939, the Grosse Lisse variety of tomato was introduced into Australia and soon became the most important commercial tomato in south-east Queensland. Unlike Pritchard and Pearson, it is an indeterminate type with strong free laterals and capable of producing big fruit. When grown on the V string trellis and pruned, fruit size was too large and, when grown on the low cradle, the crop was difficult to handle. Consequently, the high cradle or parallel wire trellis was designed for it.

The first of the parallel-wire trellises were not altogether satisfactory; they carried either too many or too few wires and spacing between wires was very variable. After a few seasons, however, trellis design was more or less standardised in its present form. It has achieved a popularity never gained by any other type of trellis and it is practicable to trellis all crops produced in the Redlands and adjacent districts. Ground crops are now grown only on a very limited scale in this area.

HOW TO CONSTRUCT IT.

The construction of the parallel wire trellis is influenced by length of row, soil type and the implements used for cultivation. The overall structure must

Plate 1.

Tomatoes on Parallel Wire Trellis. This trellis is now in general use in the metropolitan district and is particularly well suited to Q2 and related varieties now grown extensively in southern Queensland.

Plate 2.

Tomatoes on the Ground. Under this system, control of pests and diseases is difficult and fruit wastage from ground rots is excessive.

be strong as the total weight carried is considerable when the plants are in full crop and, should the trellis collapse, there is no satisfactory method of reconstructing it.

In the red-brown loams of the Redlands district, the holes for the trellis posts are usually opened-up with a post-hole digger operated by a tractor, shortly before the plants are set out in the field but after the rows have been drilled and fertilized ready for planting. If the holes are dug by hand, the work may be done either before or after planting.

Spaces between the plant rows range from 5 ft. where small dusters are employed for pest and disease control to 6 ft. where tractor operated boom sprays are used for this purpose. The posts for carrying the trellis wires are usually spaced at 1 chain intervals.

The end posts are 8 in. diameter, 8 ft. long and sunk 3 ft. in the ground. Intermediate posts are 6 in. in diameter, 7 ft. long and sunk 2 ft. in the ground. It is rarely necessary to stay the end posts in heavy textured soils but in the more sandy soils, it is advisable to use stays.

With the mechanical post-hole digger, the tractor should be run at right angles to the length of the row; this does away with a lot of unnecessary movement on land already prepared for planting. The same procedure is adopted when laying out the posts. After digging the holes, the posts are erected and lightly rammed.

At intervals throughout the area, depending on the spray system in use, certain rows not only carry the overhead Skinner spray lines but also the trellised crop. In these rows supporting posts are erected along the row at intervals and approximately 15 ft. When the crop is flood irrigated or irrigated by other types of spray system, this reinforced row is not necessary.

Between the posts in all rows, droppers or stakes are required to support the plants on the wires. Droppers measuring 6 ft. x 2 in. x 2 in. are quite satisfactory though somewhat heavy and difficult to drive into the ground. Droppers 6 ft. x 2in. x 1 in. are, however, more popular and, with care will last a number of seasons. The droppers are spaced four to the chain and are driven about 1 ft. into the ground; in the case of the 2 in. x 1 in. dropper, the greater width is placed at right angles to the row.

WIRING.

When the plants are about 1 ft. high, the first pair of parallel wires is placed in position; the work should not be delayed until the plants have commenced to fall apart. The wiring can be done by one person if wires of the right length are available but two persons are usually needed if the wire is being run off a new coil. The wire is tied securely to an end post and the coil is carried up the row, playing the wire out as one progresses. When the end of the row is reached, the wire is pulled tight by hand and tied securely; it is rarely necessary to strain the wires.

On the way back along the row to start the second wire on the opposite side of the posts, the wire already in position is nailed or stapled to the intermediate posts and droppers. At the same time, any plants not in the correct position are placed on the inside of the wire.

While staples are often used to attach the wires to the posts, they make the job of pulling down the trellis at the end of the season much more difficult and are apt to split the droppers. Strong case nails are quite satisfactory and can be easily bent out when removing the wires.

The second set of wires is usually placed about 2½ ft. from the ground and the third at a height of about 4 ft. when the plants require additional support. It is usual to fit a fourth set of wires on the trellis in a well-grown crop.

No. 14 gauge wire is suitable for use in the parallel wire trellis and, if carefully stored after use, will last several years.

CARE OF TRELLISED PLANTS.

With the Grosse Lisse and related varieties, planting distance in the trellised row is usually from 20 to 22 in. Planting closer than this may result in overcrowding.

The small amount of pruning required in the parallel wire trellis is one of its attractive features. While some growers do little or no pruning after planting, it is generally advisable to prune all plants to the lateral immediately below the first truss of flowers. This is done just before the first pair of wires is erected. The plants then develop two main arms.

No further pruning is needed apart from the removal of what are commonly called "water shoots" which arise on the stems of the plant near ground level.

PULLING DOWN THE TRELLIS.

Winders of various types are in use for removing the wires from the trellis after the crop is harvested. Some are operated from the power take-off of a tractor. It is customary to remove the bottom wires first. If the top wires are detached first, the plants fall over and tend to foul the lower wires. Posts and droppers may be raised by half hitching a chain round them and pulling them out with the power lift of a tractor. The droppers are less likely to break when removed in this way than when pulled by hand.

ADVANTAGES.

Grosse Lisse, the main variety grown on the parallel wire trellis, is a

Plate 3.

Tomatoes on V-String Trellis. A system of management developed originally for cluster varieties grown in winter, and popular some years ago for Break-o'-Day grown in spring.

strong, rampant grower which gives its best performance with a minimum amount of pruning. The parallel wire trellis best meets this requirement. When pruned, the variety has a tendency to produce fruit of larger sizes than the market requires. The free growth of laterals in the parallel wire trellis keeps the fruit to a reasonable size.

As pruning is finished early, the risk of spreading virus diseases is reduced to a minimum. This contrasts with the position in crops on the V trellis or stakes where pruning is continuously in progress to the fifth hand of fruit. Prior to the introduction of the parallel wire trellis, early summer crops grown on trellises were of little economic value owing to the high incidence of blossom end rot in pruned vines during hot weather. With the use of the parallel wire trellis, production can be prolonged well into mid-summer.

Plants in the parallel wire trellis support each other; they are not blown about and damaged in windy weather to the same extent as plants grown on other types of trellis. This is reflected in fruit quality. At the Redlands Experiment Station in 1955, differences in total yields between plants on the V string trellis and the parallel wire trellis were negligible but the percentage of blemished fruit on the V trellis was considerably higher. Fruit quality was maintained right to the last pick.

Losses from ground rots are slight and sunburn damage even in late spring is of no great importance.

The parallel wire trellis is less costly than other forms of trellis; the same materials may be used for several seasons and should last at least seven years. Row lengths and wire lengths become standardised on the farm after the initial crop, and this assists considerably in the rapid erection of subsequent trellises.

Dairy Parade

If milk and cream cans become badly rusted before being sent in for retinning, they may be beyond repair. Firms that retin cans claim that 20 to 30 per cent. of the cans being received are incapable of being retinned. This is because they've been left in a rusted condition for too long.

Before a can can be retinned, it must first be stripped. This involves removing the bands. It's on the removal of the bands that excessive rusting is found in many cans.

Freight on cans and the time involved in stripping are costly items. These costs have to be placed on the cans capable of being retinned, in this way increasing the cost of retinning. The normally slack winter period is a good time to attend to your cans.

—F. C. COLEMAN, Director of Dairy Field Services.

WINTER GRAZING CROPS

The way a dairyfarmer uses his winter grazing crops determines whether he gets full value for his outlay in growing them.

In the first place, you need continuity of grazing. You won't get the best out of crop feeding if your herd is on the crop for a week and then has to go without this rich grazing for some days.

When you start crop grazing, avoid digestive upsets through a sudden change of diet by allowing your cows 15 minutes' grazing the first day and gradually increasing it to an hour.

Strip grazing is a "must" in obtaining best results. It's been proved that you get 20 per cent. more grazing by this method. With a modern electric fence, strip grazing is easy. But always use a back wire to protect the grazed plants.

—W. F. MAWSON, Senior Adviser in Cattle Husbandry.

MORE MAKING SILAGE

Out of a group of six farmers in the Monto district four have made silage this season for the first time. At least seven more are taking steps to make silage on their farms. Some of the crops to be seen in the district have an estimated 20 tons or so to the acre.

—C. B. WRIGHT, Adviser in Agriculture.

NEW PRODUCTION RECORD

"Sunny View Little Princess 20th" an A.I.S. cow owned by Messrs. J. Phillips and Sons, Kingaroy, has established a new Queensland production record.

In 300 days she gave 24,630 lb. milk and 1,053 lb. fat, with an average test of 4.3 per cent. She calved at four years and four months and is thus classed as a Junior 4-year-old.

This production is also a record for Australia for a Junior 4.

"Little Princess 20th" now holds three A.I.S. records for Queensland. Viz.:

J2	13,122 lb. milk 5.0%	651 lb. fat
J3	18,606 lb. milk 4.5%	840 lb. fat
J4	24,630 lb. milk 4.3%	1,053 lb. fat

In three lactations, each of 300 days' duration, she produced a total of 56,358 lb. milk and 2,544 lb. butterfat, thus easily qualifying for entry into the Intermediate Merit Register.

Stock Gazette

ERGOT POISONING

MANY cases of ergot poisoning or paspalum staggers have occurred in cattle in south-eastern Queensland this season. Very few have died, but the symptoms are distressing.

Poisoned cattle develop continuous trembling of the muscles and jerky, awkward movements. This may last for several days or clear up in a matter of hours, depending on the amount of poison eaten. Poisoned cattle lose weight quickly and go off their milk. The poison responsible for the condition is contained in a fungus which attacks the paspalum seedheads.

There is no treatment for ergot poisoning. A purge of Epsom salts is frequently recommended, but affected animals will recover with rest and on being changed to a diet that doesn't contain the diseased paspalum seedheads.

—W. R. RAMSAY, Veterinary Officer.

CHECK LIGHTS IN FOWLHOUSE

FARMERS using lights in their fowlhouses to increase winter egg production are advised to check them regularly. If "blown" bulbs are not replaced immediately, the purpose of winter lighting may be defeated. Because the lights are switched on automatically by a time switch, the farmer seldom sees them burning. A blown bulb may not be detected for weeks unless regular checks are made.

If a blown bulb is not detected, even for only four or five days, egg production of that pen is likely to decrease sharply. The birds will then probably go into a moult. Dusty bulbs and reflectors can also reduce the intensity of the light. This can be avoided by frequent dusting.

—B. W. MOFFATT, Poultry Adviser.

LINSEED POISONING

DURING last year's linseed harvest, many cases of stock losses from linseed poisoning were reported to the Agriculture Department. The poison in linseed is a derivative of prussic acid and it exists particularly in the husks and seeds.

Photographic hypo is the antidote for prussic acid poisoning. Cattle and horses should be given 2 oz. of hypo in water as a drench, and sheep ½ oz. If necessary, the drench may be repeated in an hour.

Cattle and sheep should be full before being put on to linseed stubble. Extreme caution should be used when feeding off linseed stubble if screenings are available in any quantity. If screenings are to be fed in the bails or in troughs, they should be well diluted with other bulk feed. In any case, keep a supply of photographic hypo on hand.

—R. MILLAR, Veterinary Officer.

WARTS IN CATTLE

WARTS are often a problem in cattle in Queensland, especially young stock. Besides being unsightly and a cause of concern to stud breeders, warts can also retard the growth in seriously affected calves. Warty hides lose much of their market value.

Treatment depends on the severity of the infection and the type of growth. If there are only a few pendulous warts on a beast, they may be snipped off with a pair of scissors. For larger warts, a piece of fine gut, linen thread or a strong rubber band may be passed around the wart as close to the skin as possible. This is drawn tight, cutting off the blood supply to the growth and causing it to slough off.

For the flat warts that lie close to the hide, a daily swabbing with crude castor oil may be beneficial.

—R. D. LAW, Stock Inspector.